

Footwear, The Missed Evidence

Dwayne S. Hilderbrand, CLPE
Lead Latent Print Examiner
Scottsdale Police Crime Lab

Author of the book, [Footwear, The Missed Evidence](#)

"The scope of a complete examination consists of two main functions: first, the recovery process, which includes the discovery and preservation of the prints, and second, the identification process, which involves evaluations, comparisons, and findings related to the recovered impression." (Grieve 1988).

Introduction

"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 clothing, the glass he breaks, the tool mark he leaves, the paint he scratches, the blood or semen he deposits or collects.. All of these and more bear mute witness against him. This is evidence that does not forget. It is not confused by the excitement of the moment. It is not absent because human witnesses are, it is factual evidence, physical evidence cannot be wrong, it cannot perjure itself; it cannot be wholly absent, only its interpretation can err. Only human failure to find it, study and understand it, can diminish its value." (Paul L. Kirk 1974).

On September 19, 1991, two German tourists were hiking in the mountains on the border between Austria and Italy when they spotted a body buried in the ice. The two tourists, suspecting foul play, contacted the authorities. As it was not clear at the time exactly where the body was found, police authorities from Austria and Italy responded. Following the normal procedures for the recovery of the body, they attempted to free it from the ice using jackhammers. Unfortunately, the jackhammers were damaging the body, pickaxes and ski poles were then used.

Once the body had been removed from its icy grave it was examined and determined to be that of a fit man, between 25-35 years old, and about 5 feet 2 inches tall and weighing somewhere around 110 pounds. The body was fully clothed and his "well-worn shoes were made of leather and stuffed with grass to keep his feet warm."

The body was identified as that of the first completely intact 5,000-year-old Ice Age man.

Shoes are a Fascinating Item of Clothing

In almost every criminal investigation it is necessary to determine and prove that a particular person or persons may or may not have been present at the scene of a crime. For this reason, the collection, preservation and analysis of physical evidence has become more frequent in the law enforcement community.

Around 1910, a criminologist by the name of Edmond Locard arrived at a theory that every time something comes into contact with another it either takes or leaves a portion of itself or another. This theory is called the Edmond Locard Theory, which simply states "Every contact leaves its trace." This theory is continually used today in crime scene investigations and the analysis of physical evidence.

Since criminals must enter and exit crime scene areas it should therefore, be reasonably assumed that they may leave traces of their footwear. Criminals have become smarter and wiser by beginning to frequently wear protection over their hands to avoid leaving fingerprints, and masks over their faces to avoid eyewitness identification. However, they are rarely aware of, or make little attempt to conceal footwear. During an every day routine it is normal to see an

individual wearing gloves, but it's not normal to see individuals wearing protection over their shoes.

Unfortunately, when a crime scene is improperly secured or is disorganized, the search of the scene often results in this type of impression evidence being overlooked or destroyed. When this type of physical evidence is properly collected and preserved by the crime scene investigator, followed up by a detailed examination by a footwear expert, it can become an important part in proving or disproving a suspect was at the crime scene.

Why are Footwear Impressions Overlooked?

Footwear impressions are overlooked for two important reasons,

1. The lack of training and education in the proper searching, collection and preservation of the evidence and;
2. The evidence is undervalued or not understood.

The failure to properly collect this type of evidence revolves around the above-mentioned two reasons but the lack of success in finding this evidence is often due to:

- a. Not believing that the impressions can be found at the scene after people have walked over the scene
- b. Incomplete searches of the crime scene;
- c. Weather conditions;
- d. The impression has been intentionally destroyed.

In many cases, footwear evidence can lead to positive identifications of which particular known shoe made the print. Footwear evidence can provide investigators with certain information that can assist them in locating a suspect. Most footwear evidence, when collected and preserved properly can provide the type, make, description, approximate size, the number of suspects, the path through and away from the crime scene, the involvement of the evidence, and the events that occurred during the crime.

Protection of the Scene

The first officer at the crime scene should assess and attempt to determine the entire area of the crime scene, including paths of entry and exit and any areas that may include evidence that a suspect was present. Once this has been done the area of the crime scene should be completely secured and evidence marked for later documentation and collection. Unfortunately, footwear evidence is easily eradicated by weather or by people and vehicles approaching the scene from the same direction of entry or escape the suspect might have taken. Isolation of the area is crucial, to avoid analyzing recently made footwear impressions that are not related to the crime scene.

There are many ways to secure footwear evidence in and around the crime scene. Once the area is secured and the crime scene is established the officer on the scene should make sure the entire scene is marked off using crime scene barricade tape, and no one should be permitted to enter until the crime scene investigator responds. In some cases where weather might have an effect on the footwear evidence, the first officer may place boxes, cones, etc. over the impressions until the crime scene investigator arrives. Remember, do not alter the evidence prior to any photographs.

Searching the Crime Scene

Always be aggressive and alert. Footwear evidence should be one of the first considerations at the crime scene. Once the scene has been made safe by the first officer(s) on the scene, it should then be secured for the crime scene investigator. The secured area should be marked off large enough to include any possible footwear impressions that may be leading to and away from the area. This officer securing the scene should pay careful attention not to leave his footwear impressions around the scene.

If the officer must enter the crime scene area, a military-type approach and exit should be used when at all possible. This type of approach consists of the individual stepping into his/her own footprints, therefore leaving only one set of additional footprints that can later be eliminated. A restricted route should be thoroughly searched for evidence. A planned search of the area should be conducted by the crime scene investigator on the scene. The area should be carefully photographed and documented as to where each footwear impression is found. This procedure should be done before any other search is performed. Once the footwear impressions have been located and marked as to their location, the crime scene investigator can come back later and complete the photographing, casting and collecting process.

Footwear evidence can be found at almost all crime scenes in two forms, impressions and prints. The techniques in recording such evidence may be different, but the search is basically the same. Always use a methodical and planned method of searching. Never blind search a crime scene. The only footwear evidence that is not found is that which is not searched for. Footwear evidence that is located out of doors should first be photographed and if three dimensional, cast. This will prevent any unfortunate destruction of the evidence while the crime scene investigator is inside. Each impression should be documented as to its position and surrounding areas. Remember, position can tell you direction of travel.

During an interior search, all surfaces where the suspect(s) may have entered or exited the scene should be carefully examined since most of the residue on the shoes from the outside surfaces may contain valuable impressions which are not easily seen under normal lighting conditions. To locate footwear impressions on indoor surfaces, the crime scene investigator should first attempt to darken the search area as much as possible. Then using a strong white light with a directional beam, cast the light over the surface at an oblique angle. Once the impressions are located, the collection and recovery process begins. Excellent devices with strong white light are the forensic light sources. They contain a narrow beam of white light that provides an excellent source of illumination when it is held at a low angle. Also this type of light is much stronger and brighter than normal flashlights.

Whether the impressions are indoors or out, they should be photographed, documented, lifted and/or cast. A photograph or lift differs from a cast in that it is a two-dimensional reproduction of a print, just as a fingerprint lift. A cast is a three-dimensional structure which can provide a positive reproduction of the footwear.

Remember that some impressions may only lift in partial and others do not lift at all, so always attempt to photograph the prints first. If the footwear is a visible print on an item that can be retrieved from the scene to the laboratory, then this should be the method of choice. It is much easier to work on the evidence under controlled conditions than to try collecting the footwear at the crime scene, but in some cases this is not possible. There are many lifting applications on the market that have been accepted for years. Adhesive paper or contact paper can be placed over the footwear print in dust or very light dirt.

This lifting method works by placing the adhesive paper or contact paper, adhesive side down, over the impression in dust or light dirt and smoothing over. This will allow the impressions to be

transferred to the adhesive side of the paper. Once this is done the paper is then peeled off the impression and photographed. The paper can be treated with a mixture of 0.05 grams of crystal violet to 500 ml. of distilled water which stains the footwear impression, but produces a reversed image when collected. Once this is completed a piece of clear acetate is placed over the print in order to preserve it for impounding and later examination purposes.

Latent fingerprint powders and lifting tapes can be used on various surfaces for contrast and recovery.

Many of the chemicals used by latent fingerprint examiners can be used to enhance the footwear prints on a variety of items.

Many latent footwear impressions can be located with the oblique lighting technique. Once found they can be difficult to photograph, but latent fingerprint powders can be used to build contrast for easy photography. This procedure is performed in the same manner as if you were dusting for latent fingerprints. Once the prints have been developed and photographed, the recovery process is the same using fingerprint lifting tapes and suitable contrast backgrounds to place the lift on. Never cover an impression with tape to reserve it until after the completion of the photographs. The tape will only obliterate the print and make subsequent enhancement difficult. Place the tape over the impression only after all other methods of enhancement have been exhausted. Make sure the footwear evidence was not placed in dust, as there may be more suitable methods of collection.

Since 1981, an excellent recovery method for visible and invisible footwear evidence has been widely used around the world and has resulted in footwear identifications. This technology is called the electrostatic dust lifter.

The system has a high voltage electrostatic charge that creates a charge on a piece of lifting film and causes some of the dust or residue particles to transfer to the underside of the lifting film. The system works on a wide variety of surfaces including, floors, doors, countertops, chairs, fabric, metal, carpet tile, newspapers, bodies, tar and many others. The quality of the print is dependent upon the type of surface it is deposited on. No matter what the detail is that is recovered the crime scene investigator should always turn the print over to the examiner for examination.

There are four basic methods of recording footwear impressions at the crime scene.

1. Photography
2. Documentation/Sketching
3. Casting
4. Lifting

The crime scene investigator, when collecting evidence, should "use know methods in the best possible way to develop the impression to its fullest potential."

Crime Scene Footwear Evidence

Footwear evidence can be found in two forms, impressions and prints. The impression is normally described as a three-dimensional impression, such as an impression in mud or a soft material; and the print is described as a print made on a solid surface by dust, powder, or a similar medium.

Footwear evidence, as well latent fingerprint evidence, is classified into three categories of crime scene prints:

1. Visible Prints
2. Plastic Prints
3. Latent Prints

The Visible Prints: A visible print occurs when the footwear steps into a foreign substance and is contaminated by it, and then comes in contact with a clean surface and is pressed onto that surface. This print can be visibly seen by the naked eye without any other aids.

The most common visible prints are prints left on a contrasting surface, such as a kitchen floor. A variety of substances, such as blood, grease, oil, or water will leave contrasting prints. This type of print must be photographed, prior to any other methods being used. An electrostatic dust lifter can also be utilized when the evidence is in dust.

The Plastic Prints: Plastic prints are impressions that occur when the footwear steps into a soft surface, such as deep mud, snow, wet sand, or dirt creating a three-dimensional impression. This type of impression should be photographed and then cast. These types of impressions are three-dimensional because they allow the examiner to see length, width, and depth.

The Latent Prints: Latent prints are the most overlooked print and are generally found on smooth surfaces. They can be developed the same way latent fingerprints are. This type of print needs a variety of powders, chemicals and even forensic light sources to make it visible in order to properly be collected. In most cases these prints should also be photographed prior to any recovery process.

Crime Scene Photographs

Footwear impressions can be located in and outside the crime scene. Remember, the suspect had to arrive and depart the scene. The location that will later be photographed in detail should be photographed showing the general crime scene and surrounding areas. When photographing the scene always remember to take overall, medium and close up shots before you begin your comparison photographs. Always use a relationship technique when relating footwear evidence to the crime scene or to other items of evidence. An easy way to do this is to place a numbered marker next to the evidence print and photograph. Make sure the crime scene photographs have been taken prior to altering the evidence with numbered markers. When making quality examination photographs of the evidence prints, be sure to use the same number you used when you were showing relationship. After this has been done, quality examination photographs can then begin. In order for a footwear examiner to perform a quality examination, high-quality, close-up photographs are required.

This can be easily obtained with a little time and patience. The camera is mounted on a tripod and rotated in such a manner that the plane of the film is parallel to the plane of the print. This will enable the darkroom technician to print a 1 to 1 scale photograph of the impression for comparison. The print, the scale and an information card should fill the frame of the film. When using a flash, the flash should be held at least at a 45 degree angle from the print and fired from three different positions with at least 100 degrees separation. By using this oblique lighting procedure a different amount of light can be reflected from the shadowed and non-shadowed areas providing greater contrast.

This oblique lighting will cause a greater amount of contrast, and detail can be obtained in the photograph. The best way to do that is to fire the flash off at the three different positions of the tripod making sure not to get the legs of the tripod in the way of the flash. A minimum of four

photographs are taken for each footprint, one without a scale and three with the scale. A minimum of three photographs are taken for each footprint when not using a flash, one without a scale and two with the scale. The scale should always be placed parallel to the side of the shoe, never in the print itself.

When at all possible, photographs should be taken of prints made by each foot. While there is a minimum number of photographs suggested, there is NO maximum. It is always better to have too many, than too few. Remember to take overall, medium and close-up photographs prior to altering the impressions with a scale.

When the impressions are photographed correctly, they often proved the footwear examiner with more detailed impressions that lifting or casting thus resulting in a more definite examination and comparison.

In tracking, which is the process of following the footprints of an individual, photograph the scene as you found it and then lace numbers next to each impression. Photograph the scene showing the impressions' numbers, this way you can come back later and relate where each impression was found. Then the quality examination photographs can be taken.

Casting an Impression

In the past years, plaster of paris was used for the casting of footwear and tire tread impressions; however, it is now recommended that only dental stone be used for casting impressions. Dental stone, like plaster of paris, is a form of gypsum, but provides a superior result. Dental stone has proven to be much stronger, and therefore, does not require that reinforcement material be placed in the cast during the pouring. Most importantly, dental stone is more durable and harder than plaster of paris and can be cleaned in the laboratory with a potassium sulfate solution, with virtually no loss or erosion of detail from the surface. Dental stone is available from local dental supply stores and the overall cost is less than plaster of paris.

Three dimensional impressions should always be cast if there is clarity and the surface will permit.

Why Cast?

1. The cast gives lifelike and actual-size molding of the original impression including uneven surfaces and depths.
2. The cast gives reproduction of microscopic characteristics.
3. In deep impressions, the cast gives reproduction of characteristics of the side of outsoles and midsoles of the shoe which usually are not reproduced in photographs.
4. Focus or scale problems are eliminated.
5. Provides tangible 3-dimensional evidence.
6. Backs-up the photographs.

How Many Impressions do I Cast?

The way to answer this question is simple. If at a crime scene you develop 10 latent impressions, you might surmise that some of these impressions have sufficient detail to effect an identification and others may not. Would you still lift five of those ten and leave the other five at the scene? Remember the real possibility that the most valuable evidence might be left behind. Use the same consideration when casting or photographing footwear impression evidence.

Evidence left at the crime scene can never be recovered and will follow you all the way to court.

Making a Cast:

Materials Needed

- 2-3 pounds of class- 1 dental stone per cast
- One-gallon zip-lock plastic bag per cast
- One large mixing bowl or coffee can
- One spoon or stirring stick
- 6-9 oz of water per pound of dental stone
- One form (not always necessary, but useful)
- One can of Talcum powder

A form, or other material with which a form can be made around the impression to contain the dental stone, gives the cast thickness and is handy, but is not necessary.

Mixing Procedures

Procedure 1: Place the form around the impression. Be careful not to place the form so close to the impression that it risks distorting it. Place 2-3 pounds of dental stone in the mixing container. Add roughly 6-9 oz. of water per pound of dental stone. Mixing usually takes about 5-7 minutes or until "pancake batter" consistency.

Procedure 2: Take the 2-3 pounds of dental stone that is contained in a one-gallon zip-lock plastic bag and add your water accordingly. Close the zip-lock bag and mix by meshing together.

Pouring: Before pouring the mixture onto the impression, very lightly sprinkle talcum powder over the impression, which gives a fixative. Be sure not to over sprinkle. Pour the mixture onto the spoon or stirring stick while holding the spoon or stick to the side of the impression. By pouring the mixture in this manner you can direct the flow of the mixture and let it flow back into the impression. If you use the plastic bag technique, cut one of the corners off the bag and pour in the same manner. By using the plastic bag technique there is very little mess and no clean up.

DO NOT POUR THE MIXTURE DIRECTLY INTO THE IMPRESSION!!

Since you are using dental stone you do not need to use reinforcement material. Before the cast can harden, scratch the necessary identifying information on the back side. This information may differ from one police department to another.

1. name or initials
2. date
3. case number
4. other important information

The cast must set undisturbed for at least 30 minutes, after which the cast can be carefully lifted from the surface. Place a knife one inch from the cast and stick it directly into the ground and under the cast. Pry upwards. The cast should break free from the surface. Some soil or dirt may adhere to the cast, however DO NOT attempt to clean it. Allow the cast to air dry at least 24-48 hours before cleaning. After this time the cast can be cleaned and washed VERY GENTLY. Once this is completed the cast can be packaged for impounding.

DO NOT impound or package the cast in plastic. Use porous packaging material, making sure to carefully package the cast so that it will not break during transport.

Replacement Casting Material: You can replace dental stone with plaster of paris (which can be purchased at almost any hardware store). The plaster of paris requires 15 oz. of water to 5 lbs. of plaster and will require a form and reinforcement material.

The pouring procedure is the only difference from the dental stone.

Pouring: Using a form, pour the mixture onto the stirrer while holding the stirrer to the side of the impression. After pouring about half of the mixture onto the impression, add the reinforcement material (i.e.; sticks, small pieces of metal wires) and then complete the plaster pouring.

Casting in Water

Place a form around the impression, making sure the frame is large enough to come above the waterline. Be careful not to place the form so close to the impression that it risks distorting it. Remove any debris from the surface of the water. Lightly sprinkle the dental stone material over the area of the impression, about one (1) inch, allowing it to settle. Prepare a mixture of dental stone that is slightly thicker. Place the mixture into the frame by scooping. Allow 60 minutes for drying. Remove and air dry 48 hours.

Casting in Snow

Place a form around the impression. Spray "Snow Print Wax" over the impression and allow it to set up for about 10 minutes. If "Snow Print Wax" is not available, talcum powder or gray primer spray can be used, but the pouring must be done very carefully. Prepare a mixture of dental stone using very cold water. Pour the dental stone onto the impression very carefully. Cover the impression with a box and allow the cast to dry for about 60 minutes. Remove and air dry for 48 hours.

Admissibility of Footwear Evidence

"The role of the expert witness is not to determine guilt or innocence, but rather to assist the court in determining what weight is to be placed on technical evidence entered which without assistance could not be interpreted properly." (Cassidy, 1980)

The crime scene investigator should always approach the crime scene as if the attorney met you at the front door and told you, "tomorrow we are going to court." The best way to prepare for any trial is to be prepared for the unexpected.

If a thorough crime scene report is prepared, the crime scene investigator can describe the steps of the investigation chronologically. Remember, your reports and notes are subject to subpoena during a trial.

The crime scene investigator should understand the techniques and legal requirements necessary to ensure that the crime scene photographs and the evidence collected will be admissible in court.

The basic premise involved in crime scene photography is that the photographs are a true representation of the scene as it was initially observed by the investigator. Nothing will cause evidence to be tossed out of court faster by defense attorneys than no photographs of the footwear evidence prior to the crime scene investigator placing a scale in the photograph or not following proper procedures. Defense attorneys will argue that the evidence was altered.

Crime Scene Investigators are considered to be expert witnesses in the investigation of the crime scene. The expert witness is determined only by the court. The court will weigh the qualifications, experience, and demeanor of the investigator carefully every time that he/she appears. The expert witness is allowed to give an opinion on any relevant issue that is within the scope of their expertise.

Once the footwear evidence has been entered into evidence, the Footwear Examiner will take the stand to testify as to the examination or comparison procedures. Never allow yourself to become caught up in testifying to an examination or the comparison of footwear evidence unless you have been properly trained and possess the experience, qualifications and training of a footwear examiner.

References

Some of the listed books are old and out of print, but they contained important information for the writer of this article.

1. Bodziak, William J., *Footwear Impression Evidence*, Elsevier Series, 1990.
2. Bodziak, William J., US Department of Justice; FBI, *Shoe and Tire Impression Evidence*, September 1986.
3. Cassidy, M.J., *Footwear Identification*, Canadian Government Printing Centre, 1980.
4. Grieve, D., *Journal of Forensic Identification*, International Association for Identification, 1988.
5. Jaroff, Leon, *Reader's Digest*, "Mystery of the Iceman," Condensed from *Time*, April 1993.
6. Joseh, Alexander and Allison, Harrison C., *Handbook of Crime Scene Investigation*, Allyn and Bacon, Inc., 1980.
7. Kirk, Paul, *Crime Investigation*, Interscience Publishers, Inc., NY 1953.
8. McDonald, Peter, *Tire Imprint Evidence*, Elsevier Series, 1989.
9. Ojena, Stephen M., *Law and Order*, "New Electrostatic process Recovers Visible and Invisible Dust Particles at Crime Scenes," July 1988.
10. Svensson, Arne; Wendel, Otto; and Fisher, Barry A.J., *Techniques of Crime Scene Investigation*, Elsevier NY, 1984.
11. A paper written on Put the Suspect at the Scene of the Crime, no dates or other documentation.
12. US Department of Justice, *FBI Law Enforcement Bulletin*, "Scientific Aides, Preserving Prints of Shoes and Tires on Hard Surfaces", June 1961.
13. US Department of Justice, *FBI Law Enforcement Bulletin*, "Tips on Making Casts of Shoes and Tire Prints", October 1963.

Recommend this page to a friend

-
- More information about the book [Footwear, The Missed Evidence](#)
 - [Return to the Evidence Collection Page](#)

this information is posted on www.crime-scene-investigator.net