

TECHNICAL NOTE

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An Improved Technique for the Visualization of Footprint Impressions in the Insoles of Athletic Shoes

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ABSTRACT: Although instances of analysis and comparison of footprint impressions in footwear to identify that footwear to a particular individual are rare, the necessity of this type of analysis may be crucial in obtaining certain information for forensic science purposes. The most common method for the visualization of footprint impressions in insoles of footwear is by examination of the insoles under standard laboratory lighting or ultraviolet light. A simple technique of casting the interior of athletic shoes including the cloth insoles with Duroc® dental casting material will generally enhance the quality and visibility of footprint impressions even when impressions are not readily apparent under various lighting conditions. The resulting three-dimensional cast with additional points of identification is also available, thus giving the examiner a number of data points and models with which to make comparisons, and, perhaps, an identification.

KEYWORDS: criminalistics, footprints, castings, footwear, comparison, identification

The presence of footprint impressions in insoles of footwear have enabled law enforcement to identify and determine ownership of a particular pair of shoes to an individual. Footprint impressions are unique. No two persons have identical feet [1]. In fact, there are no "pairs of feet" [2]. Each foot has its own set of identifying characteristics even when excluding ridge minutiae. These include morphological features such as: toe position, toe angle, ball width, heel width [3], and "well" impressions [1].

Traditionally, the examination of footwear for footprint impressions mainly consisted of an examination under incandescent, fluorescent, and ultraviolet light sources (Fig. 1). Once an impression was located it was photographed, then plaster or moulage casts [1,2] were made of the interior of the shoes. Thus, a visual examination could be made on the two-dimensional representation. The casts provided a three-dimensional model of the foot, thereby adding areas and points of comparison.

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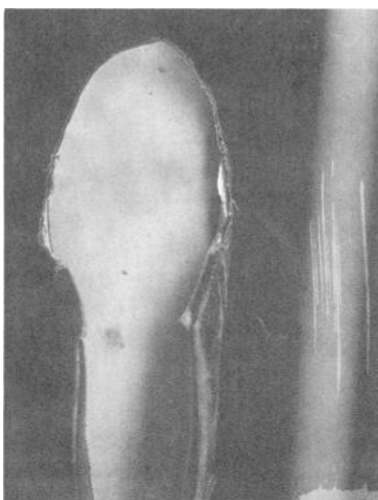


FIG. 1—Ultraviolet lighting of untreated insole. (Note faint footprint impression.) (Insole has not been removed from shoe.)

Methods and Materials

Initial examination of the interior of footwear in our laboratory is still being conducted by conventional lighting methods. An attempt was made to enhance the quality of footprint impressions in athletic shoes by chemical means. Reagent applications such as: ninhydrin (Fig. 2), iodine fuming, and silver nitrate (Fig. 3) yielded some encouraging results; however, the application of all the reagents together soon obliterated the "prints," and made any future comparison attempt hopeless. Casts were made of the interiors of untreated shoes

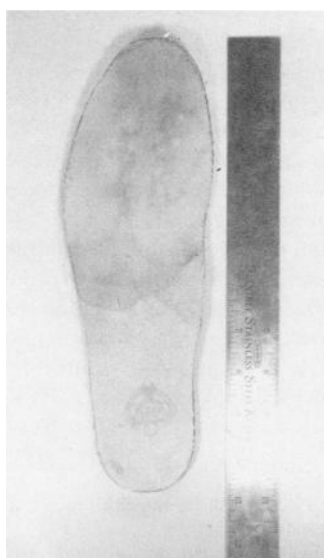


FIG. 2—Ninhydrin treated insole under incandescent lighting.

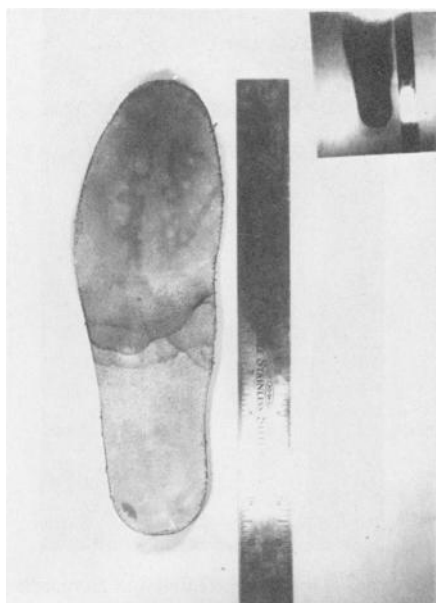


FIG. 3—*Ninhydrin and silver nitrate treated insole under incandescent lighting.*

with plaster of paris. While good casts can be made using this material, the durability of the casts have serious shortcomings.

A second type of casting material was chosen for its ability to retain accurate impressions and it has demonstrated increased durability. This material is sold under the trade name Duroc™ [4] and is used as a dental casting material (available from Ranson and Randolph, Toledo, Ohio or Los Angeles, California).

A mix of three parts of the yellowish powder and water yields a material with consistency of plaster of paris when wet. When dry, the material has a yellow color and is stronger and slightly more dense than plaster of paris.

The interior of the shoes are first sprayed with RC900 Silicone Release Agent supplied by George F. Cake, P.O. Box 649, Berkeley, CA. The 3 : 1 mix of Duroc is then poured into the shoes and allowed to set for at least 2 h under standard laboratory conditions. The shoes are then cut open, being careful not to disturb the toe areas, using a sharp scalpel, and the casts removed. After the shoes dry overnight, the insoles are examined under standard lighting and then with ultraviolet light. Photographing the insoles with high contrast black-and-white film will enhance the quality of the impressions (Fig. 4). The results demonstrated an enhanced footprint impression in shoes where weak or nonapparent impressions had been recorded before the Duroc casting.

Summary

It is apparent that pressure in conjunction with perspiration and salt deposits exuded from the foot inside footwear under normal wearing conditions yields an imprint of the bottom of the foot in the insoles of the shoe. These foot imprints, though lacking in detail of the actual foot, can on occasion display enough individuality to aid the examiner in establishing the ownership of that footwear. Duroc casting in the cloth insoles of athletic shoes appears to enhance the visibility of the pressure points with both incandescent and ultraviolet lighting,

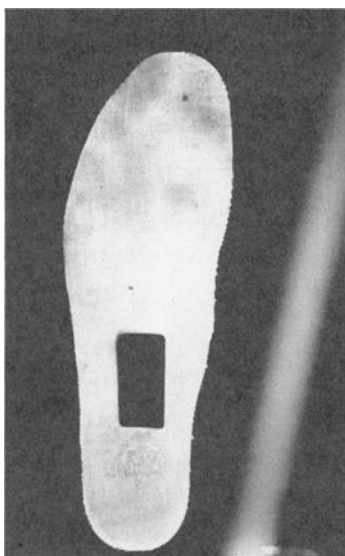


FIG. 4—Ultraviolet lighting of insole previously treated with Duroc. Black rectangle = 2 in. (5 cm).

by an unknown mechanism, thereby giving an examiner additional comparison features with which to render an expert opinion.

References

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