Fire Arms, Tool Marks and Impressions II

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Overview

Gunpowder residue

Primer residue

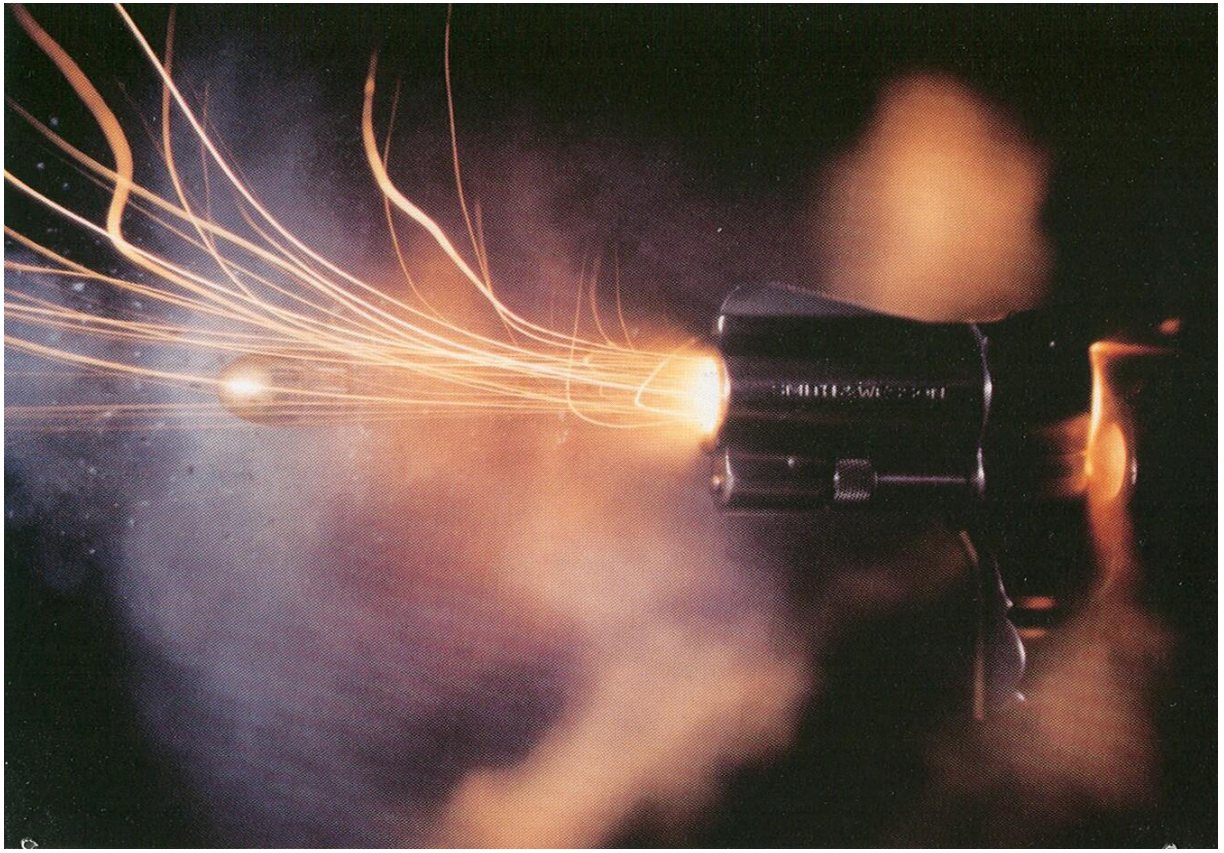
Collection of firearms evidence

Serial numbers

Tool marks and other impressions

Lecture Order Change

Gunpowder Residue



http://www.adfs.alabama.gov/FATM.aspx

Gunpowder Residue

When a firearm is discharged, unburned and partially burned particles of gunpowder in addition to smoke are propelled out of the barrel along with the bullet toward the target.

If the muzzle of the weapon is sufficiently close, these products will be deposited onto the target.

The distribution of gunpowder particles and other discharge residues around a bullet hole permits an assessment of the distance from which a handgun or rifle was fired.

Gunpowder Residue

The precise distance from which a handgun or rifle has been fired must be determined by means of a careful comparison of the powder-residue pattern located on the victim's clothing or skin against test patterns made when the suspect weapon is fired at varying distances from a target.

By comparing the test and evidence patterns, the examiner may find enough similarity in shape and density upon which to base an opinion as to the distance from which the shot was fired.

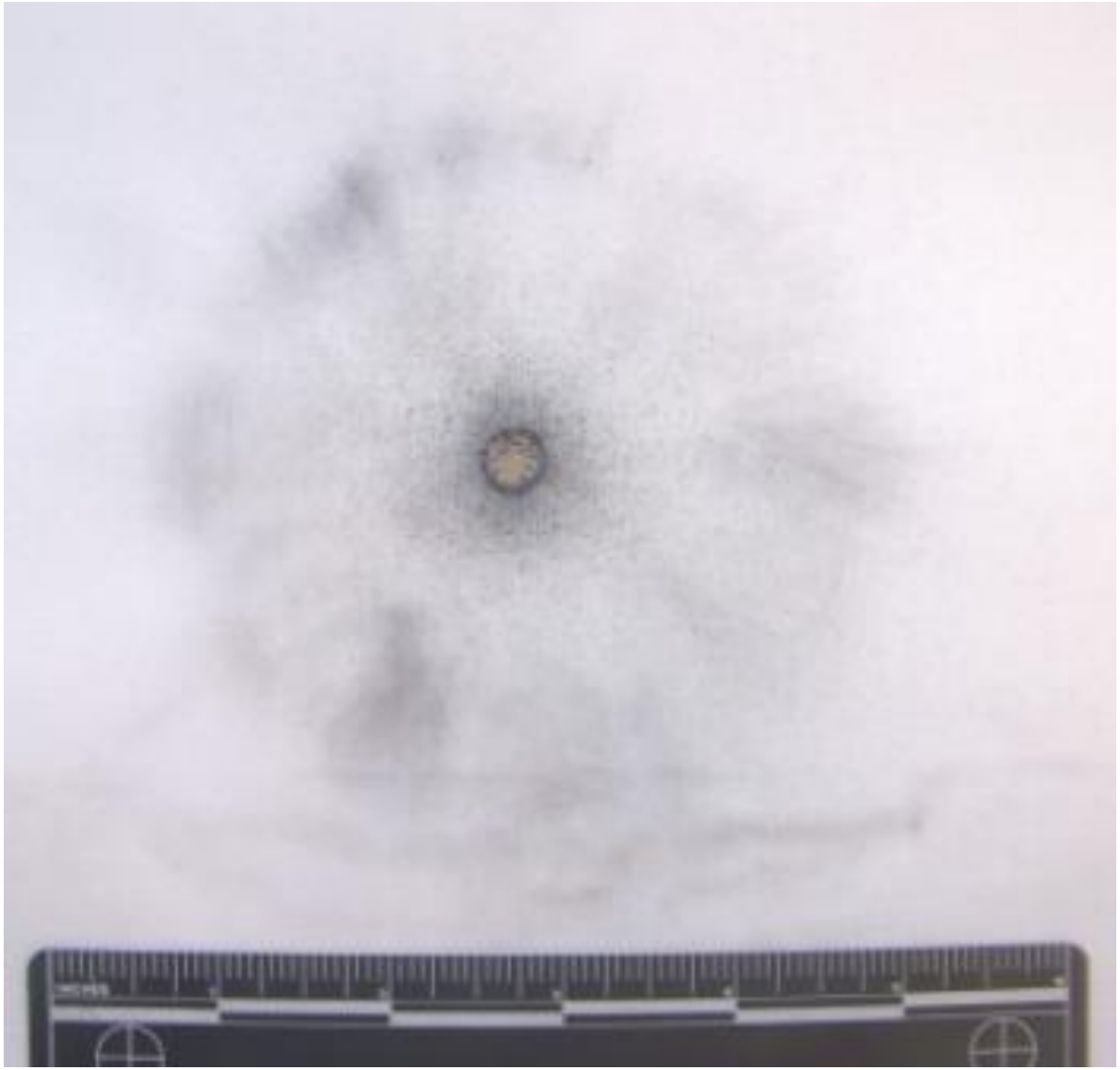
Gunpowder Residue

In cases where the weapon is held in contact with or less than 1 inch from the target, a star-shaped (stellate) tear pattern around the bullet hole entrance, surrounded by a rim of a smokeless deposit of vaporous lead is usually present.

A halo of vaporous lead (smoke) deposited around a bullet hole is normally indicative of a discharge of 12 to 18 inches or less.

The presence of scattered specks of unburned and partially burned powder grains without any accompanying soot is often observed at distances up to 25 inches (and occasionally as far as 36 inches).

More than 3 feet, will usually not deposit any powder residues, and the only visual indication is a dark ring around the hole, known as a bullet wipe.



https://dps.mn.gov/divisions/bca/bca-divisions/forensic-science/Pages/distance-proximity-determinations.aspx

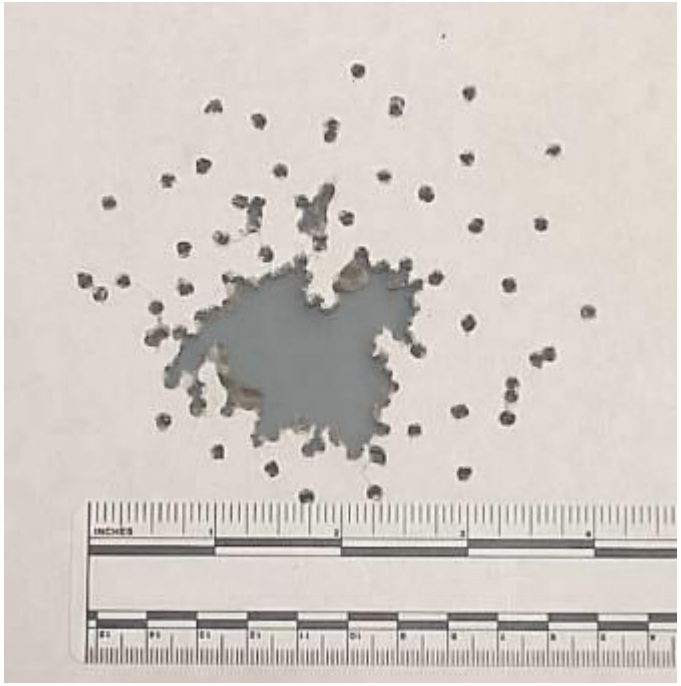
Gunpowder Residue

When garments or other evidence relevant to a shooting are received in the crime laboratory, the surfaces of all items are first examined microscopically for the presence of gunpowder residue.

Chemical tests, such as a modified Greiss test (The Griess test is a chemical analysis test which detects the presence of organic nitrite compounds. NO_2-), may be needed to detect gunpowder residues that are not visible, NO_2- is a by product of firing smokeless gunpowder

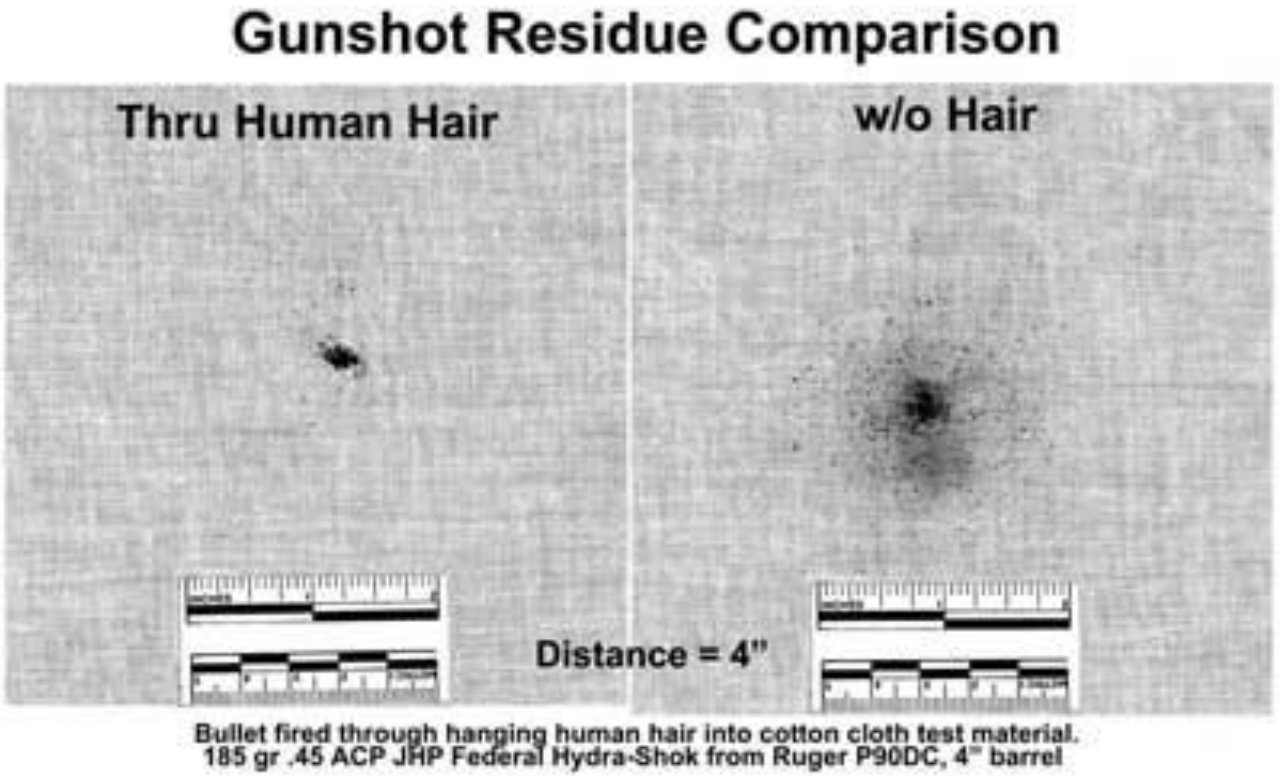
The firing distances involving shotguns must also be related to test firing.

The muzzle to target distances can be established by measuring the spread of the discharged shot.



https://dps.mn.gov/divisions/bca/bca-divisions/forensic-science/Pages/distance-proximity-determinations.aspx

Influence of hair on GSR



http://www.fbi.gov/about-us/lab/forensic-science-communications/fsc/april2004/research

Primer Residue

http://en.wikipedia.org/wiki/.50_caliber_handguns

Primer Residue on Hands

The firing of a weapon not only propels residues toward the target, but gunpowder and primer residues are also blown back toward the shooter.

As a result, traces of these residues are often deposited on the firing hand of the shooter, and their detection can provide valuable information as to whether or not an individual has recently fired a weapon.

Primer Residue on Hands

Examiners measure the amount of barium and antimony on the relevant portion of the suspect's hands, such as the thumb web, the back of the hand, and the palm.

They may also characterize the morphology of particles containing these elements to determine whether or not a person has fired, handled a weapon, or was near a discharged firearm.

Firearm Evidence Collection

Firearms are collected by holding the weapon by the edge of the trigger guard or by the checkered portions of the grip.

Before the weapon is sent to the laboratory, all precautions must be taken to prevent accidental discharge of a loaded weapon.

In most cases, it will be necessary to unload the weapon.

When a revolver is recovered, the chambers, their positions, and corresponding cartridges must be recorded.

Firearm evidence must be marked for identification (usually a tag on the trigger guard) and a chain of custody must be established.

Firearm Evidence Collection

Bullets recovered at the crime scene are scribed with the investigator's initials, either on the base or the nose of the bullet.

The obliteration of striation markings that may be present on the bullet must be scrupulously avoided.

The investigator must protect the bullet by wrapping it in tissue paper before placing it in a pillbox or an envelope for shipment to the crime laboratory.

Fired casings must be identified by the investigator's initials placed near the outside or inside mouth of the shell.

Discharged shotgun shells are initialed on the paper or plastic tube remaining on the shell or on the metal nearest the mouth of the shell.

Serial numbers and Tool Marks

Serial Numbers

Increasingly, the criminalist is requested to restore a serial number when it has been removed or obliterated by grinding, rifling, or punching.

Restoration of serial numbers is possible through chemical etching because the metal crystals in the stamped zone are placed under a permanent strain that extends a short distance beneath the original numbers.

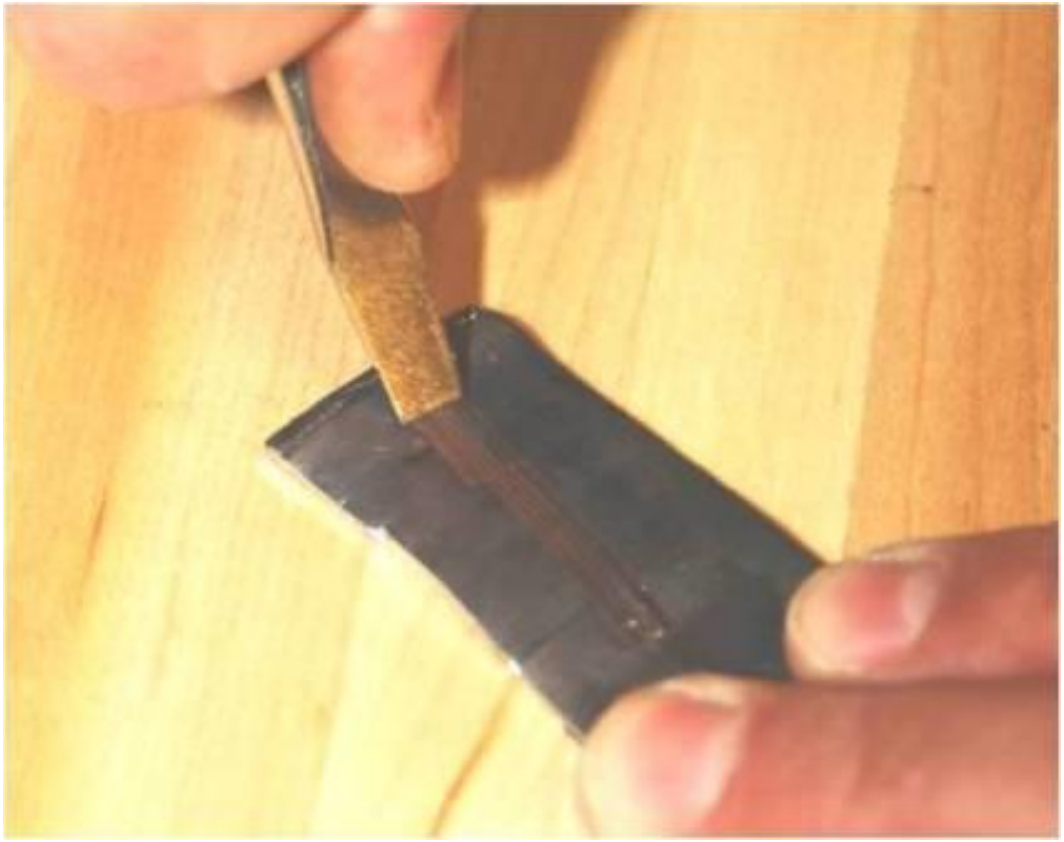
Tool Marks

A tool mark is considered to be any impression, cut, gouge, or abrasion caused by a tool coming into contact with another object.

A careful examination of the impression can reveal important class characteristics, such as the size and shape of the tool.

But it is the presence of any minute imperfections on a tool that imparts individuality to that tool.
The shape and pattern of such imperfections are further modified by damage and wear during the life of the tool.

https://dps.mn.gov/divisions/bca/bca-divisions/forensic-science/Pages/toolmark-examinations.aspx



Toolmark Examiners evaluate tools to determine that they are capable of producing the questioned mark. They will then use the tool to make test toolmarks, usually in soft lead.

Tool Marks

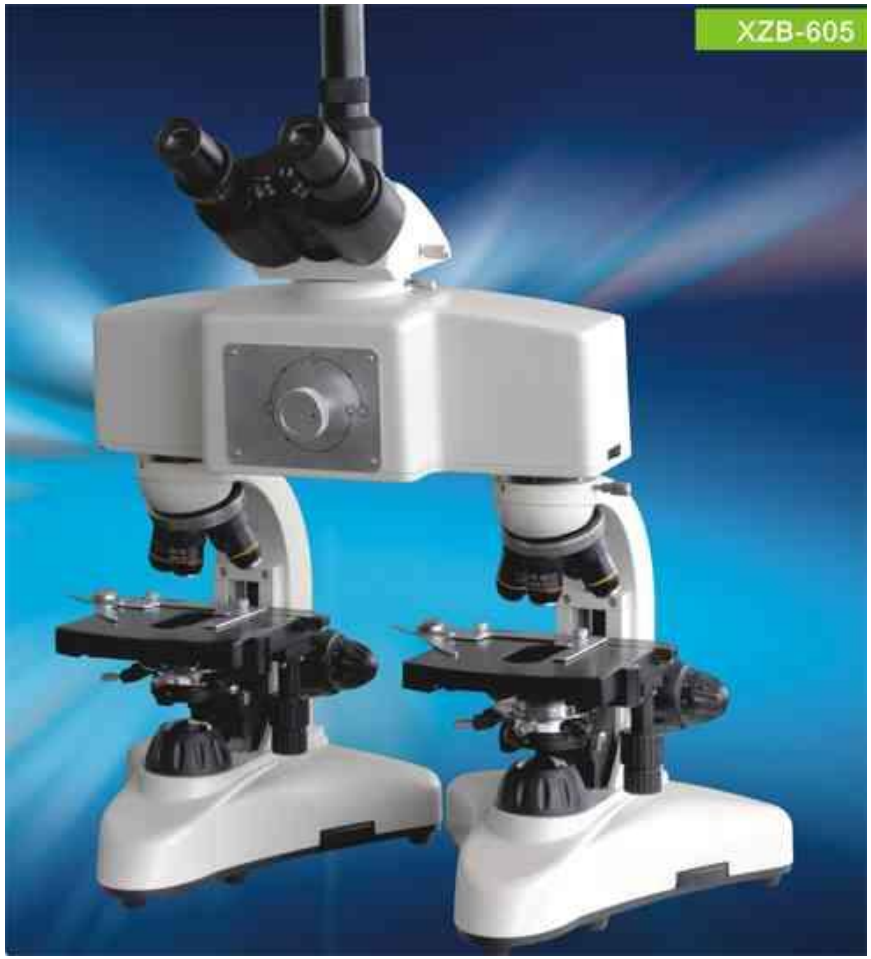
The comparison microscope is used to compare crime-scene toolmarks with test impressions made with the suspect tool.

When practical, the entire object or the part of the object bearing the tool mark should be submitted to the crime laboratory for examination.

Under no circumstances must the crime scene investigator attempt to fit the suspect tool into the tool mark.

- Any contact between the tool and the marked surface may alter the mark and will, at the least, raise serious questions about the integrity of the evidence – trace evidence transfer

Comparison Microscope



http://www.aimscope.com/XZB-605%20Comparison%20Microscope.htm

http://www.firearmsid.com/Case%20Profiles/ToolmarkID/toolmark.htm

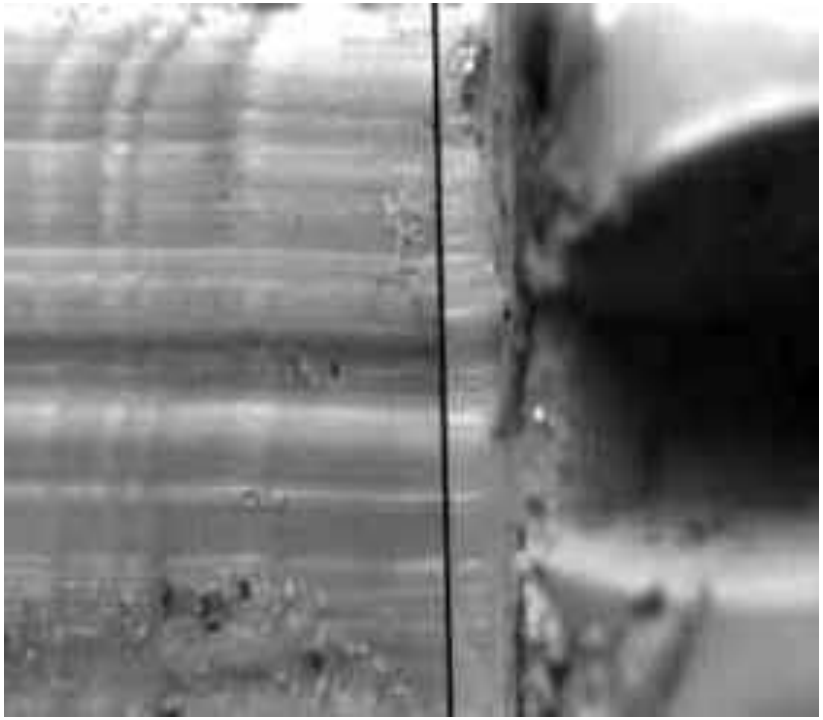


Figure 6. 20X comparison of tool mark standard (left) and questioned tool mark (right).

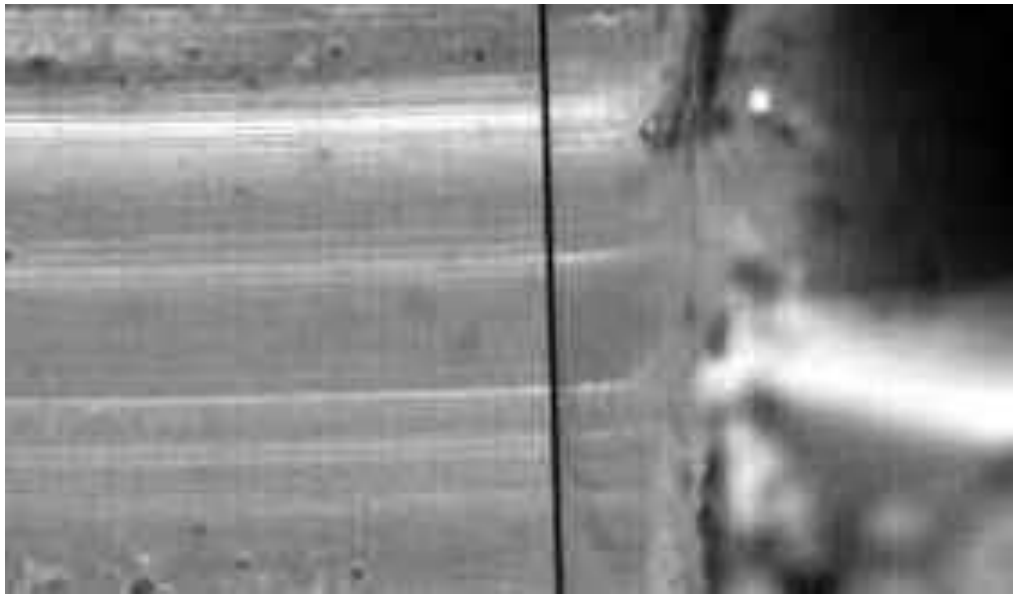


Figure 7. 40X comparison of tool mark standard (left) and questioned mark (right).

Other Impressions

Impressions of other kinds, such as shoe, tire or fabric impressions, may be important evidence.

Before any impression is moved or otherwise handled, it must be photographed (including a scale) to show all the observable details of the impression.

If the impression is on a readily recoverable item, such as glass, paper, or floor tile, the evidence is transported intact to the laboratory.

If the surface cannot be submitted to the laboratory, the investigator may be able to preserve the print in a manner similar to lifting a fingerprint.

Other Impressions

When shoe and tire marks are impressed into soft earth at a crime scene, their preservation is best accomplished by photography and casting.

http://www.youtube.com/watch?v=mquyNZaNbPo

https://www.shopevident.com/category/casting-footwear

In areas where a bloody footwear impression is very faint or where the subject has tracked through blood leaving a trail of bloody impressions, chemical enhancement can visualize latent or nearly invisible blood impressions.

Footprint impressions in blood

"Leucocrystal violet reacts with the heme-group in blood to give a violet color."
https://dps.mn.gov/divisions/bca/bca-divisions/forensic-science/Pages/forensic-programs-crime-scene-leuco.aspx

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Points of Comparison

A sufficient number of points of comparison or the uniqueness of such points will support a finding that both the questioned and test impressions originated from one and only one source.

Computer software and web sites may be able to assist in making shoe print and tire impression comparisons.

Also, bite mark impressions on skin and foodstuffs have proven to be important evidence in a some homicide and rape cases – recently refuted

Review

Quiz and ONLINE lab and Questions

Gunpowder residue

- Ejected from the barrel, distance from the gun to the victim (smoke, vaporous lead, powder grains etc.), electron microscopy, Greiss test, test firing

Primer residue

- Blow back, antimony, barium

Serial numbers

Collection of firearms evidence

- Maintain the physical evidence present

Tool marks and other impressions

- Class characteristics, individual characteristics, types of impressions, collecting impressions, comparisons