

TOOL MARKS

Firearms :

- 1) Types
- 2) Gun barrel markings
- 3) Bullet examination

Introduction :

Structural variations and irregularities cause by the scratches, nicks, breaks and wear may permit the criminalist to relate a bullet to gun, scratches and marks help to link the particular weapon/gun, a tire track to a particular automobile

We need to know how these work to know what an evidential value can be, or to understand the evidential value.

The markings left on the bullet is for a 'specific' gun.

Handguns

Single shot pistols

→ Fire only one round a time

Revolvers

→ Feature several firing chambers within a revolving cylinder

→ including swing-out revolvers, break-top revolvers and solid frame revolvers.

Semi-automatic pistols

→ a removable magazine

→ fire one shot per trigger

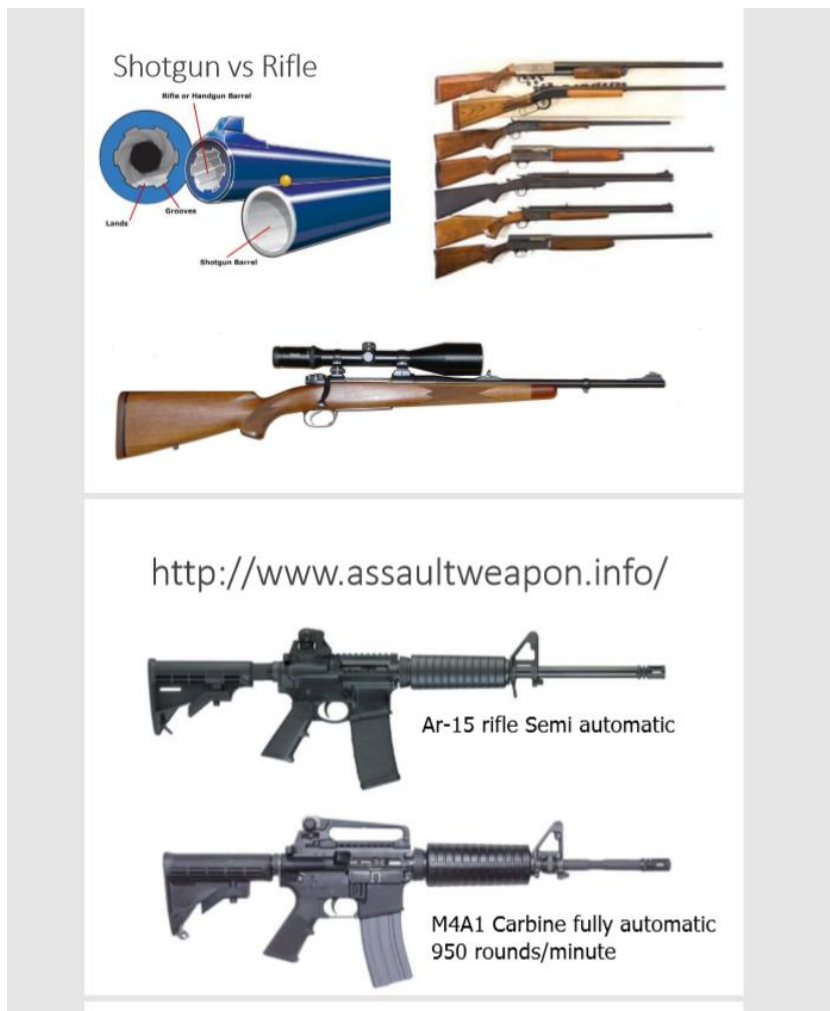


Long guns

They can wither be single shot, repeating, semi-automatic or automatic

Shotguns -- Shell ammunition contains numerous ball-shaped projectiles, called shot -- Narrowing of the smooth barrel, called the choke of the shotgun, can concentrate shot when fired

Rifles -- Feature a barrel with lands and grooves -- Bullet ammunition is impressed with lands and grooves during firing



Gun barrel markings

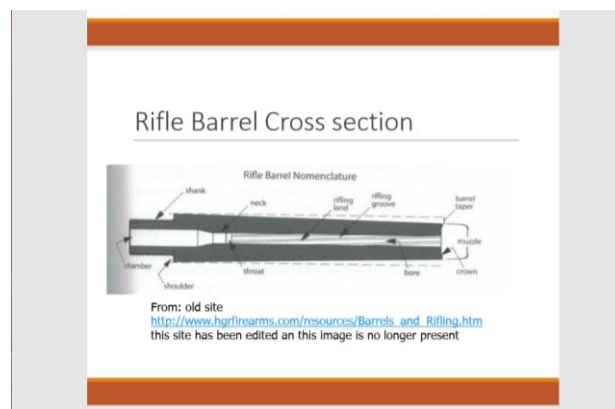
→ The inner surface of the barrel of a gun leaves its markings on the bullet when it is passing through it.

These markings are unique to individual weapons

The gun barrel is made from a solid bar of steel that has been hollowed out by drilling

The microscopic drill marks left on the barrel's inner surface are randomly irregular and serve to impart a uniqueness to each barrel.

- ➔ The manufacture of a barrel also requires impressing its inner surface with spiral grooves, a step known as rifling
- ➔ The surfaces of the original bore remaining between the grooves are called lands.
- ➔ The grooves serve to guide a fired bullet through the barrel, imparting a rapid spin to ensure accuracy.



These are all very important information for forensics

- ➔ The diameter of the gun barrel, measured between opposite lands, is known as caliber.
- ➔ Once a manufacture chooses a rifling process, the class characteristics of the weapon's barrel will remain consistent, each will have the same numbers of lands and grooves, with the same approximate width and direction twist.

Grooves, lands and bore

FROM:
http://www.hgrfirearms.com/resources/Barrels_and_Rifling.htm



Striations

They are the fine lines found in the interior of the barrel, are impressed into the metal as the negatives of minute imperfections found on the rifling cutter's surface, or they are produced by minute chips of steel pushed against the barrel's inner surface by a moving broach cutter.

These striations form the individual characteristics of the barrel.

It is the inner surface of the barrel of a gun that leaves its striation markings on a bullet passing through it.

Bullet examination

No two rifled barrels are same, even when manufactures in succession. They can never have identical striation markings.

The number of lands and grooves and their direction of twist are obvious points of comparison during the initial stages of an examination between an evidence bullet and a test-fired bullet.

Any differences in these class characteristics immediately serve to eliminate the possibility that both bullets travelled through the same barrel.

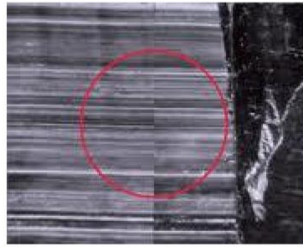
Manufacturing process involves cutting/drilling those grooves in. while cutting the scraps of metal comes off and sticks between the barrel and cutter and thus giving individual 'striations' (scratch marks)

Comparison Microscope :

Serves as the single most important tool to a firearms examiner.

Two bullets can be observed and compared simultaneously within the same field of view.

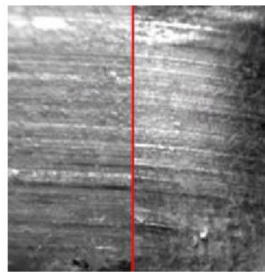
Striations and Firing pin mark



<http://www.spencerresearch.demon.co.uk/firearms.html>

Not just lands and grooves but other striations also need to line out.

http://www.nij.gov/training/firearms-training/module11/fir_m11_t04_01.htm



Groove impression striations on .38 special caliber lead bullets fired from a Rohm revolver (individual characteristics)

Bullet is also a metal so there may be variations as the weapon ages, as metal on metal is a reason for creation of scratches and striations

If we don't get any information from bullet fired, then how do we link the weapon.

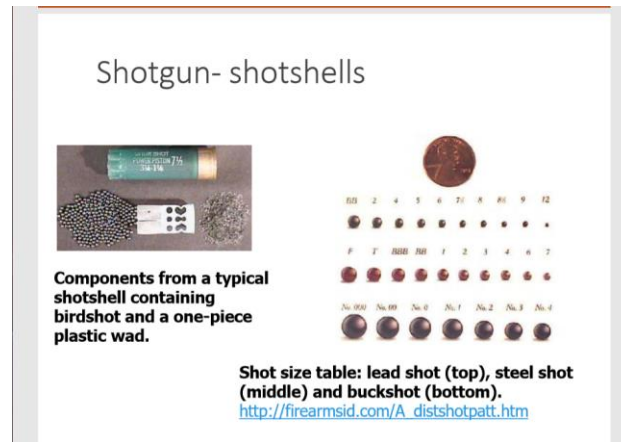
Shotguns

→ Shotguns have smooth barrel unlike rifled firearms.

They are generally fire small lead balls or pellets that are not impressed with any characteristic markings that can be related back to the weapon.

The diameter of the shotgun barrel is expressed by the term gauge.

The higher the gauge number, the smaller the barrel's diameter. E.g., 10, 12, 16, 20, 28



Firing a weapon:

The act of pulling the trigger serves release the weapon's firing pin, causing it to strike the primer, which in turn ignites the powder.

The expanding gases generated by the burning gunpowder propel the bullet forward through the barrel, simultaneously pushing the spent cartridge case or shell back with equal force against the breechblock.

The shell is impressed with markings by its contact with the metal surfaces of the weapon's firing and loading mechanisms

Cartridge Case Comparison :

The firing pin, breechblock, and ejector and extractor mechanism also offer a highly distinctive signature for individualization of cartridge cases.

The shape of the firing pin will be impressed into the relatively soft metal of the primer on the cartridge case.

The cartridge case, in its rearward thrust, is impressed with the surface markings of the breechblock.

Other distinctive markings that may appear on the shell as a result of metal to metal contact are caused by the:

- ➔ Ejector, which is the mechanism in a firearm that throws the cartridge or fired case from the firearm.
- ➔ Extractor, which is the mechanism in a firearm by which a cartridge of a fired case is withdrawn from the firing chamber.
- ➔ Magazine or clip, which is the structure in a firearm that holds the bullets.



Computerized imaging :

This Technology has made possible the storage of bullet and cartridge surface characteristics in a manner analogous to automated fingerprint files.

The National Integrated Ballistics Information Network, NIBIN, produces database files from bullets and cartridge casings retrieved from crime scenes or test fires from retrieved firearms, often linking a specific weapon to multiple crimes. I

It is important to remember, however, that the ultimate decision for making a final comparison will be determined by the forensic examiner through traditional microscopic methods.