

Fire Arms, Tool Marks and Impressions - B

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Midterm B Results To Date

Average ~ 82%

Range 42% to 98%

Overview of today's lecture

Firearms

- Types
- Gun barrel markings
- Bullet examination

Introduction firearms, toolmarks and impressions

Structural variations and irregularities caused by scratches, nicks, breaks, and wear may permit the criminalist to relate:

- A bullet to a gun
- A scratch or abrasion mark to a single tool
- A tire track to a particular automobile

Individualization, a goal in all areas of criminalistics, frequently becomes an attainable reality in firearm and tool mark examination.

Handguns

Single-shot pistols

- Fire only one round at a time

Revolvers

- Feature several firing chambers within a revolving cylinder
- Include *swing-out revolvers*, *break-top revolvers*, and *solid frame revolvers*

Semi-automatic pistols

- Feature a removable magazine
- Fire one shot per trigger pull

Semi-Automatic Pistol



Long Guns

Long guns may be single-shot, repeating, semi-automatic, or automatic.

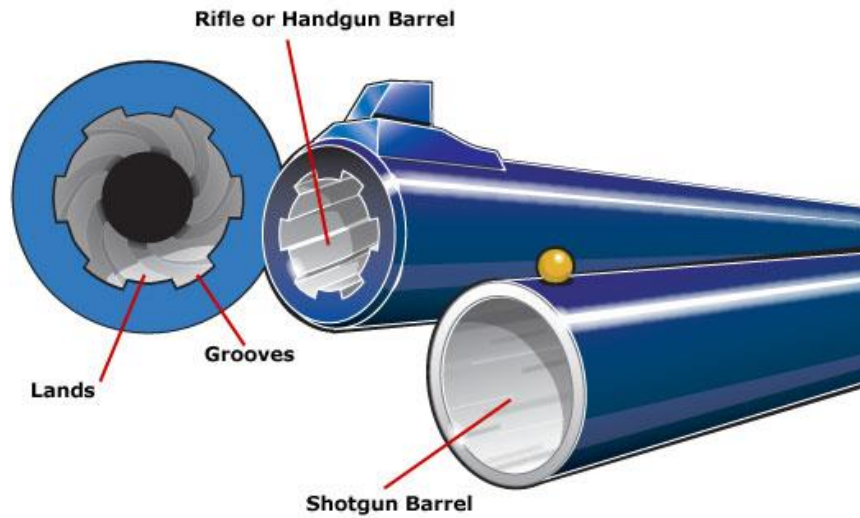
Shotguns

- 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

Shotgun vs Rifle



<http://www.assaultweapon.info/>



Ar-15 rifle Semi automatic



M4A1 Carbine fully automatic
950 rounds/minute

Gun Barrel Markings

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

These markings are peculiar to each gun.

The gun barrel is produced 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.

Gun Barrel Markings

The manufacture of a barrel also requires impressing its inner surface with spiral grooves, a step known as **rifling**.

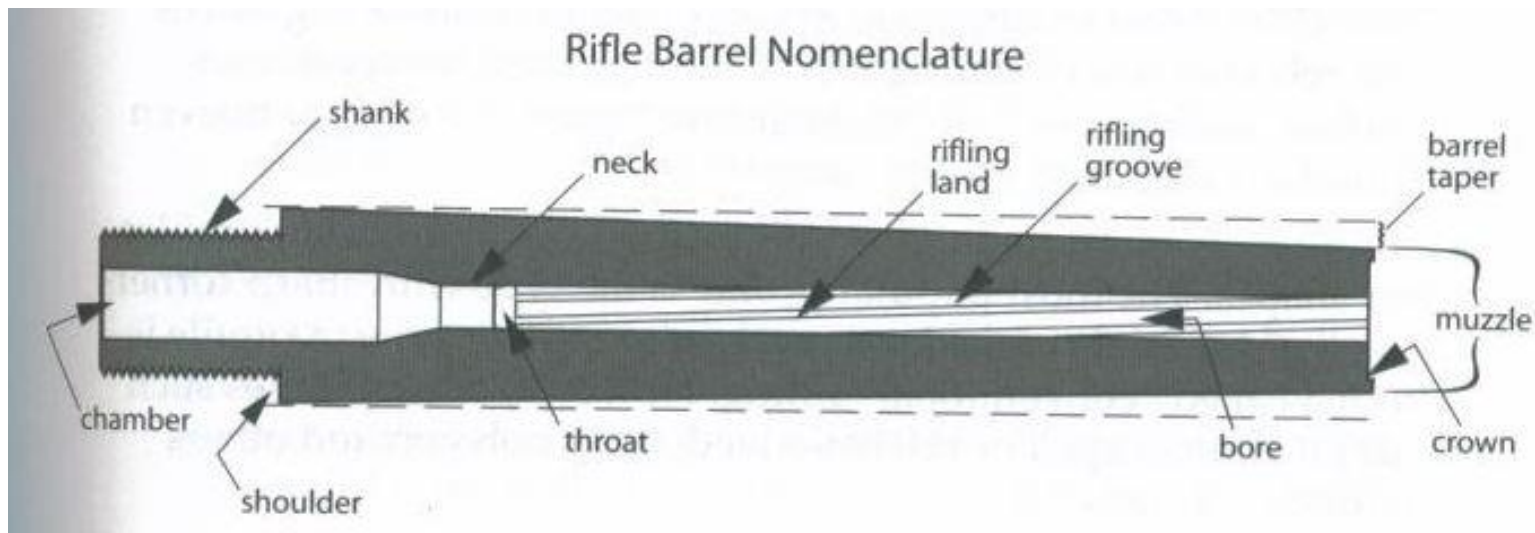
The surfaces of the original bore remaining between the grooves are called lands.

The grooves serve to guide a fired bullet through the barrel, imparting a rapid spin to ensure accuracy.



<http://www.rhinovault.com/Ballistics.htm>

Rifle Barrel Cross section



From: old site

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

this site has been edited an this image is no longer present

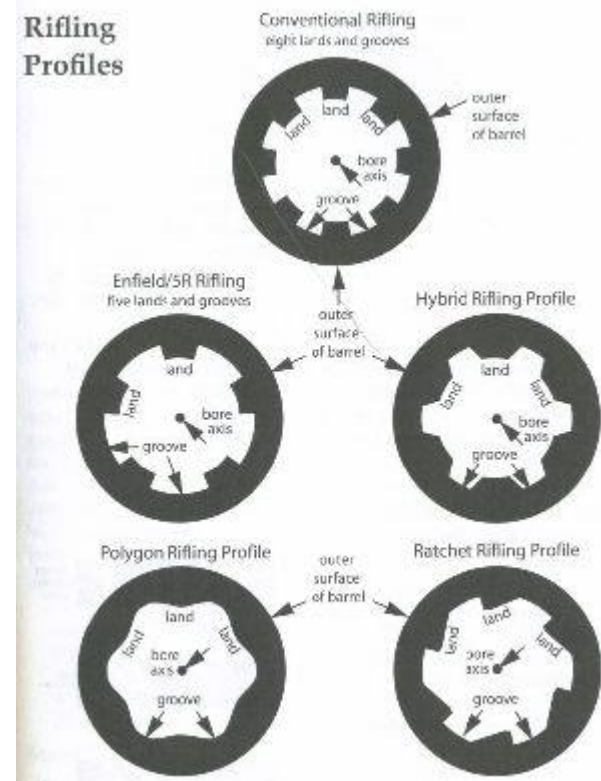
Gun Barrel Markings

The diameter of the gun barrel, measured between opposite lands, is known as caliber.

Once a manufacturer chooses a rifling process, the class characteristics of the weapon's barrel will remain consistent, each will have the same number of lands and grooves, with the same approximate width and direction of twist.

Grooves, lands and bore

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



Striations

Striations, which are 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, even those manufactured in succession, will 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 traveled through the same barrel.

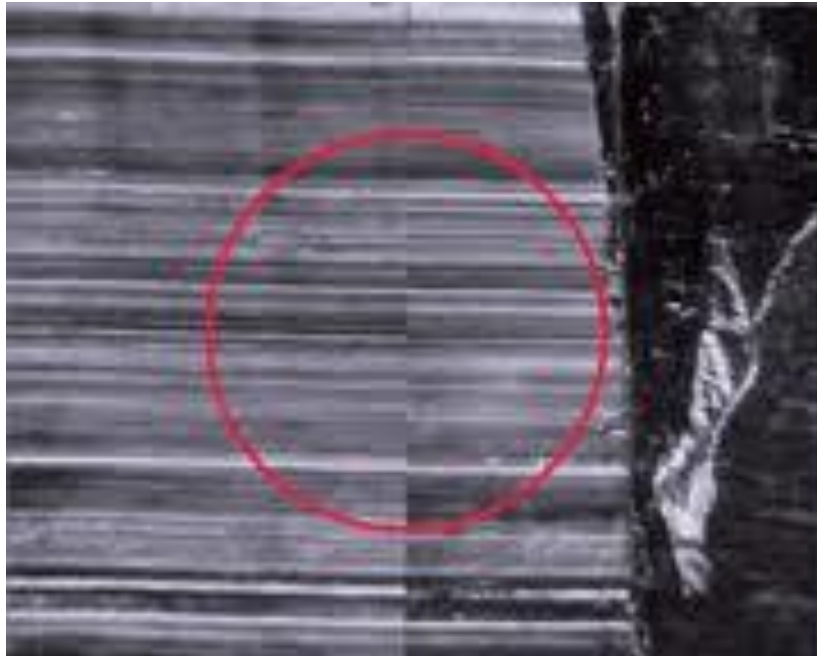
The Comparison Microscope

The 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.

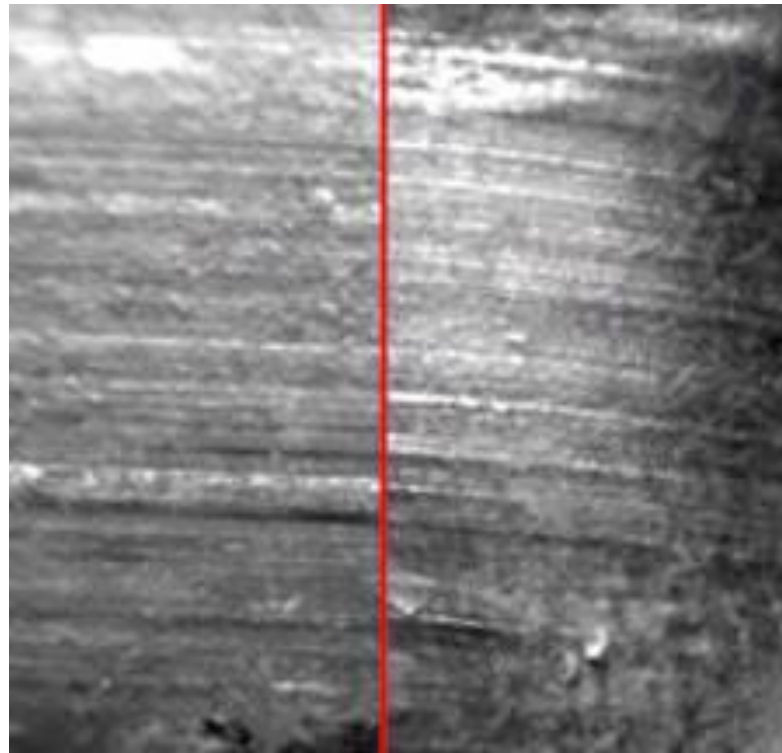
Not only must the lands and grooves of the test and evidence bullet have identical widths, but the longitudinal striations on each must coincide.

Striations and Firing pin mark



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

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)

Shotguns

Unlike rifled firearms, a shotgun has a smooth barrel.

Shotguns 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.

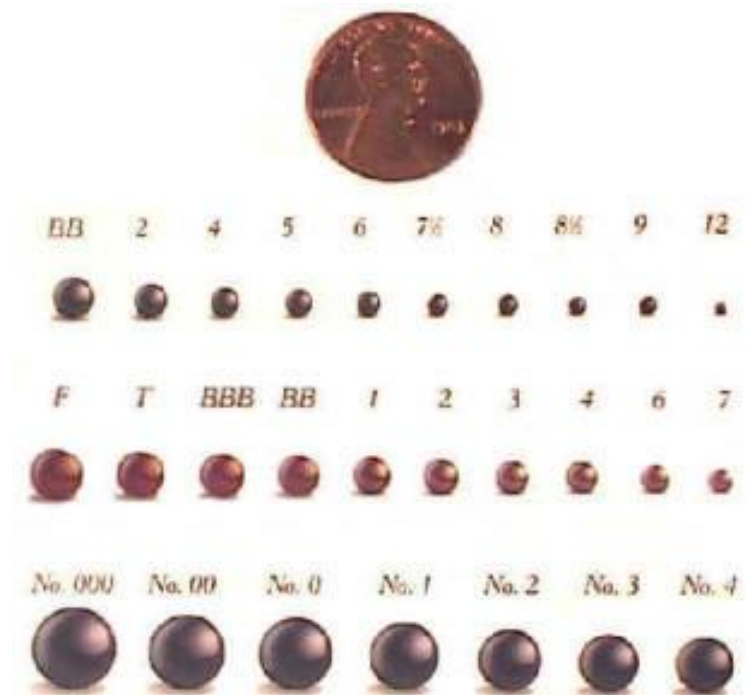
The higher the gauge number, the smaller the barrel's diameter.

- E.g. 10, 12, 16, 20 or 28

Shotgun- shotshells



Components from a typical shotshell containing birdshot and a one-piece plastic wad.



Shot size table: lead shot (top), steel shot (middle) and buckshot (bottom).

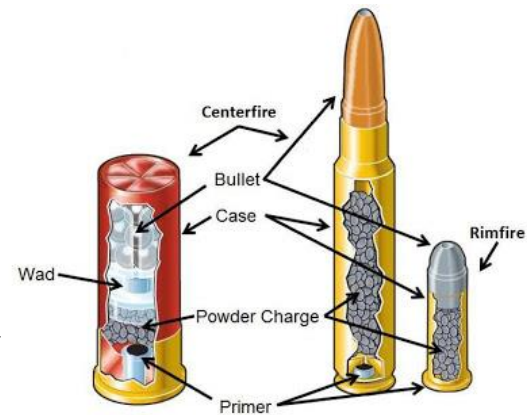
http://firearmsid.com/A_distshotpatt.htm

Firing a Weapon

The act of pulling the trigger serves to 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.

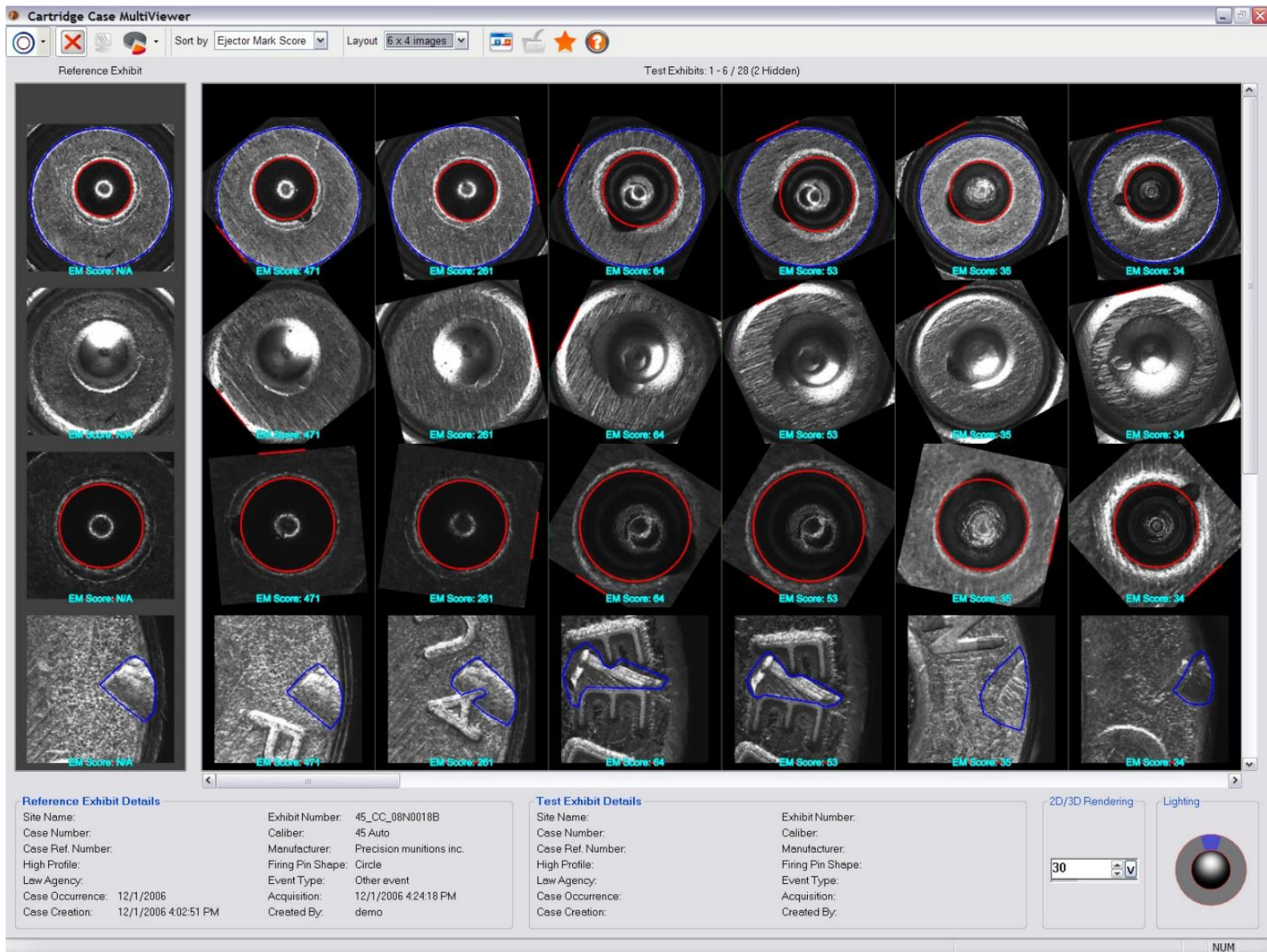
The shape of the firing pin will be impressed into the relatively soft metal of the primer on the cartridge case.

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

Cartridge Case Comparison

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 or a fired case is withdrawn from the firing chamber.
- Magazine or clip, which is the structure in a firearm that holds the bullets.



multi-viewer - technology has advanced eg trax HD3D, see:
<http://www.ultra-forensicstechnology.com/ibis>

Computerized Imaging

Computerized imaging 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.

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.

Review

Firearms

- Types
- Gun barrel markings
- Bullet