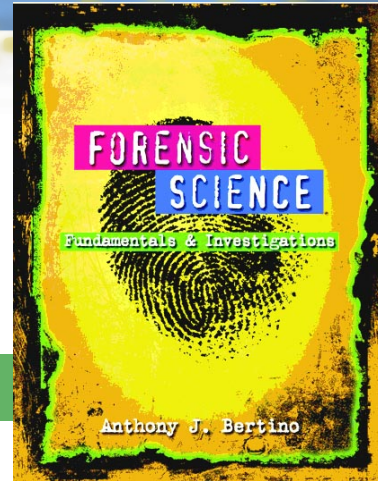


Chapter 17 *Ballistics*

By the end of this chapter you will be able to:



- describe rifling on a gun barrel and explain how it marks a bullet
- explain barrel size and caliber
- describe how bullets are test fired and matched
- discuss the role of ballistics recovery and examination at a crime scene
- determine the position of the shooter based on bullet trajectory

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Introduction

Ballistic evidence helps explain:

- What type of firearm was used.
- The caliber of the bullet.
- The number of bullets fired.
- Where the shooter was.
- Whether a weapon was fired recently.
- If a firearm was used in previous crimes.

History of Gunpowder and Firearms



- The Chinese invented gunpowder over a thousand years ago.
- Muzzle-loading matchlocks used wicks to ignite the gunpowder.
- The cartridge and breech loading followed.
- Rifling provided greater accuracy.
- Revolver, semi-automatic, and automatic handguns were developed.

Different Types of Firearms

■ Semiautomatic Pistol

- A repeating firearm requiring a separate pull of the trigger for each shot fired, and which uses the energy of discharge to perform a portion of the operating or firing cycle*



■ Revolver

- A firearm with a cylinder having several chambers so arranged as to rotate around an axis and be discharged successively by the same firing mechanism.*

Double Action - A mechanism in which a single pull of the trigger cocks and release the hammer.*



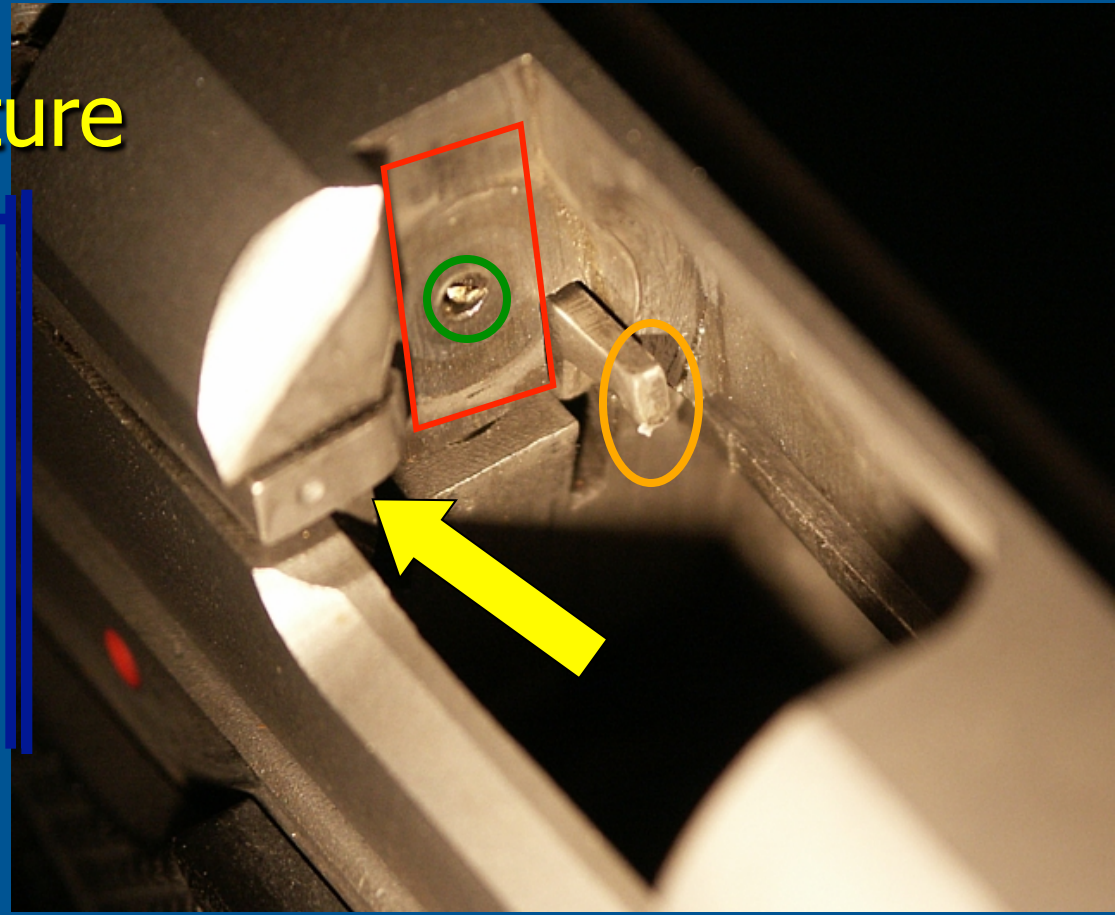
Firearm Nomenclature

- Slide
- Barrel
- Extractor
- Trigger
- Hammer
- Safety



Firearm Nomenclature

- Breechface
- Ejector
- Firing Pin Aperture
- Extractor



Basic Operation

- **When the trigger is pulled to fire the weapon, the hammer is driven down onto the firing pin, which in turn strikes the primer of the cartridge.**
- **The primer mixture explodes, and this event in turn causes ignition of the powder.**
- **The powder burns rapidly, generating an enormous amount of gas pressure within the confined space of the cartridge.**
- **The pressure forces the slug out of the cartridge, through the barrel, and out of the muzzle of the weapon.**
- **Each of these steps leaves class and individualistic characteristics on the bullets and casings.**

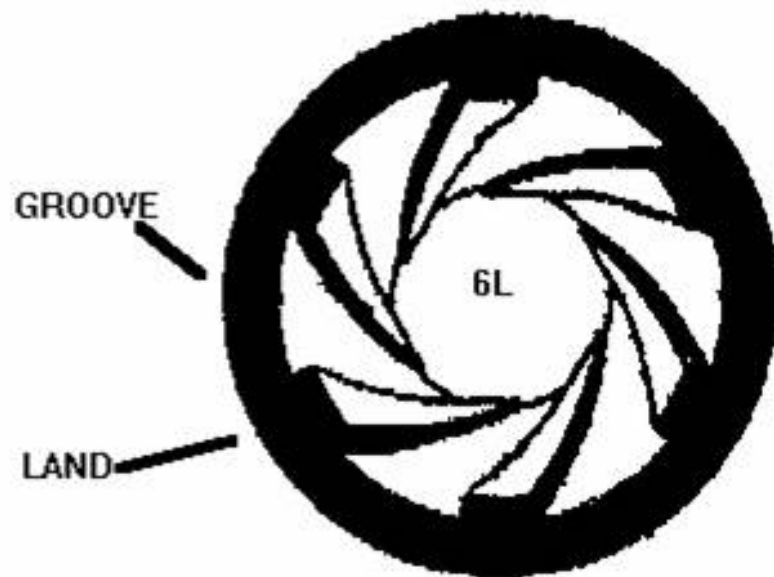
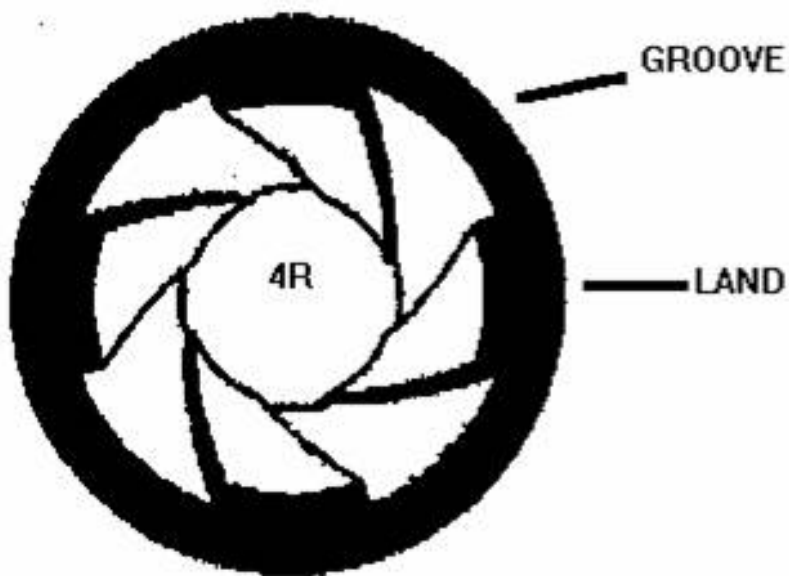
Functioning of a Firearm



Video compliments of www.firearmsid.com and Hi-Point firearms

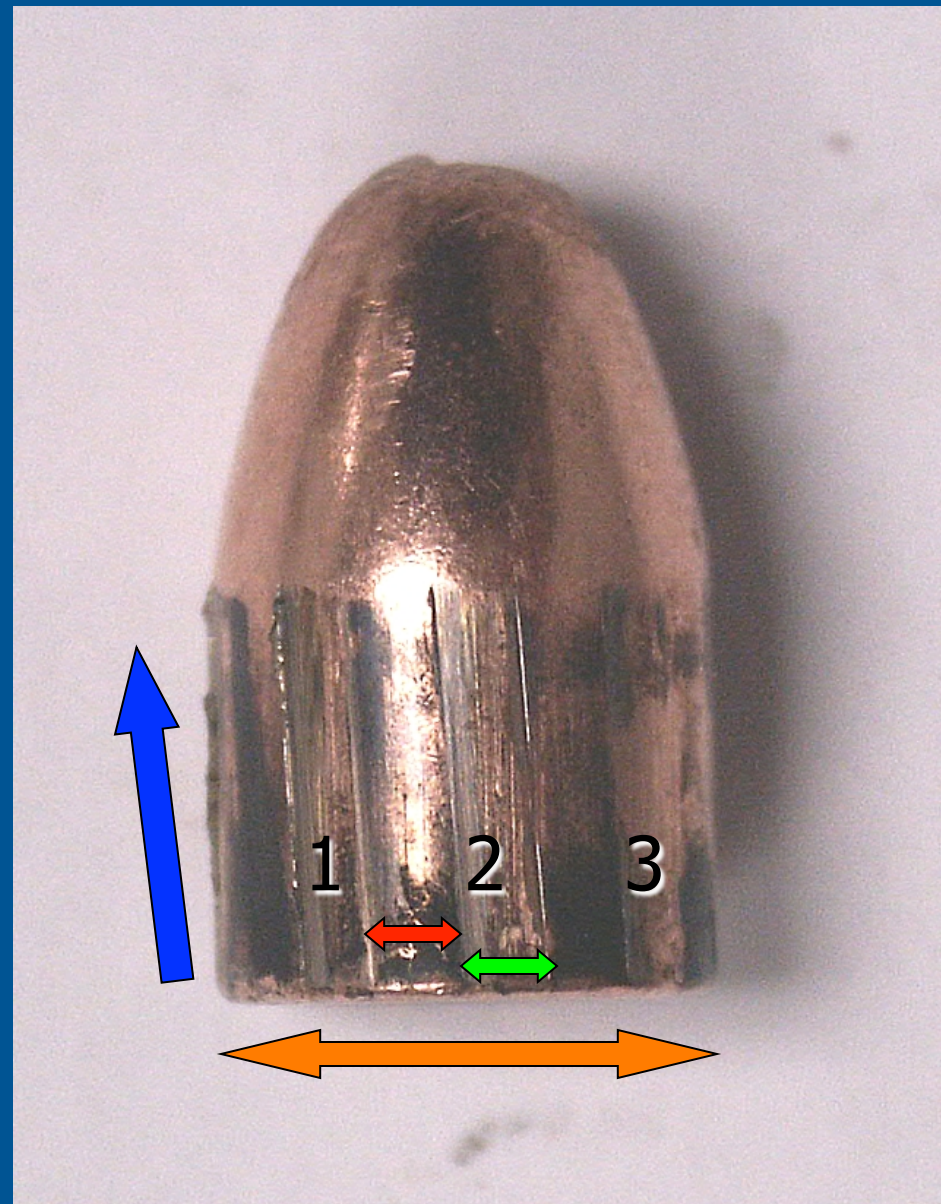
Slug Analysis-Class Characteristics

- Each barrel has four class characteristics
 1. Caliber (bore diameter: .357, .22, .45)
 2. Number of lands and grooves
 3. Direction of twist
 4. Width of the lands and grooves



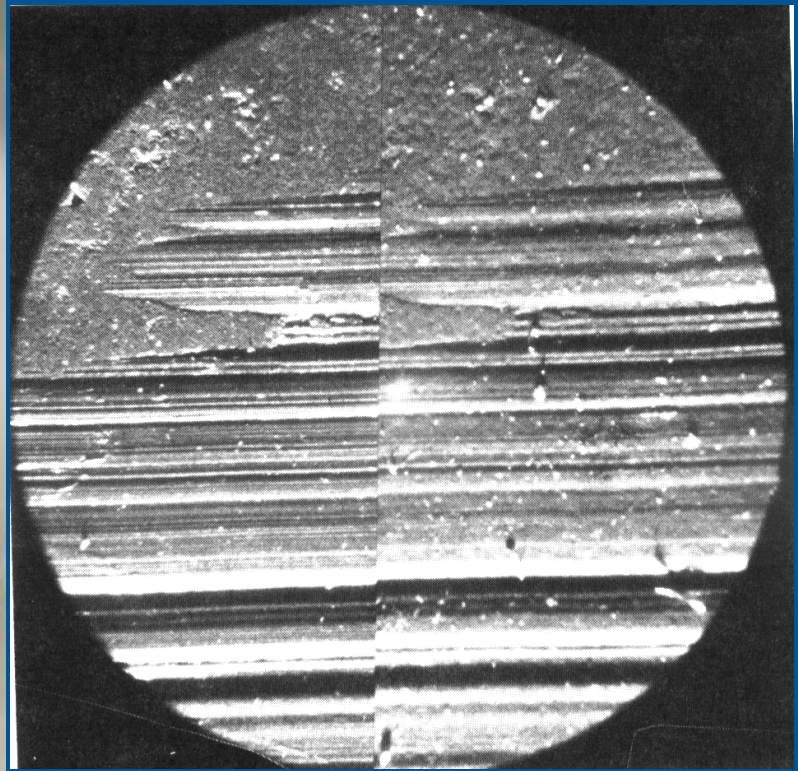
Class Characteristics-Measured

- All class characteristics are measurable
- Caliber
- Number of lands and grooves
- Width of the **lands** and **grooves**
- Direction of twist



Beyond Class Characteristics

- If we look beyond the lands and grooves under a microscope, we can also see microscopic scratches called striations.
- These microscopic scratches are a by-product of the manufacturing process and are totally unique to a particular firearm making them individualistic.
- Thus, the scratch marks on the bullet match the scratch marks in the barrel of the gun that fired it, to the exclusion of all other weapons.
- Bullets can be test fired by a suspect weapon and then compared under a comparison microscope, side by side, to a bullet recovered from the crime scene.
- Seeing these striations side by side is difficult to do in the high school lab.
- Striations may be visible under a stereomicroscope, but a real side by side comparison is difficult to do without a comparison microscope.



Real Striation Comparison under a microscope

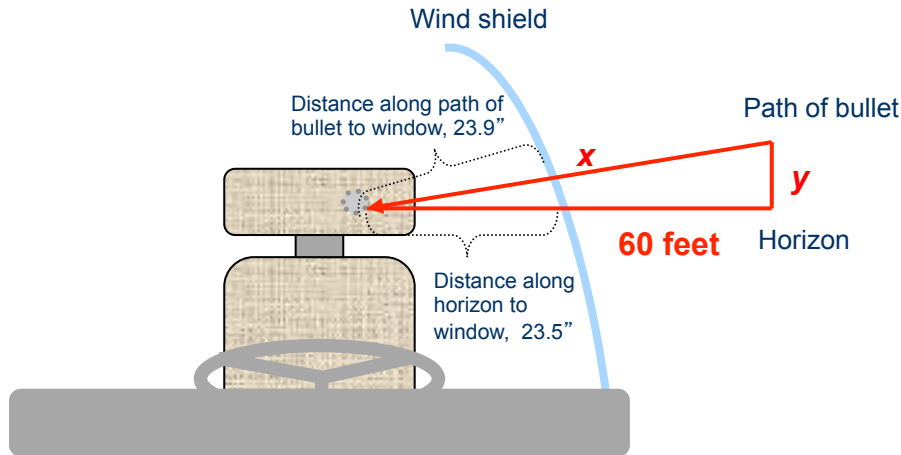


Gunshot Residues

- Particles of unburned powder and traces of smoke are the residues of gunshots.
- They can leave a trace on the hand, arm, face, hair, or clothing of the shooter.
- They can also leave a trace on the victim.
- Chemical testing often can detect residue even if removal is attempted.
- The distance from the victim to the shooter can be determined by examination of the residue pattern on the victim.



Trajectory



- Two reference points are needed to define the trajectory.
- Investigators can figure the shooter discharged the firearm somewhere along that line.



Trajectory

- Reference points can be bullet holes in objects or victims.
- An entry point and exit point on a victim can be used.
- Gunshot residue or spent cartridge casings can be less specific reference points.
- Investigators can use lasers to trace a straight-line path to help determine the position of the shooter.



Trajectory

Determining the Location of the Shooter

Using the illustration on Slide 11 and adding that the shot came from a nearby building, these conclusions can be made:

1. Since the building is about 60 feet away, the shooter was about 11 feet above the bullet hole in the seat, which was 4 feet above the ground.
2. This height of about 15 feet off the ground puts the shooter on the second floor in that building.