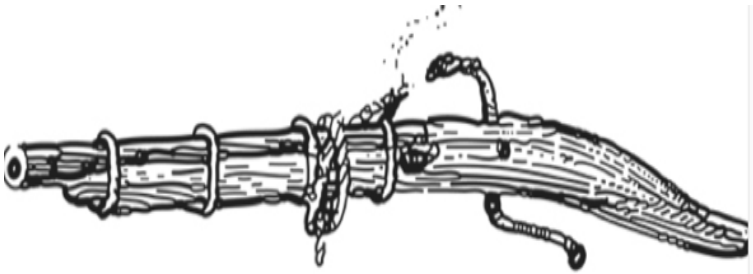
Unit 8: Firearms & Ballistics

Introduction

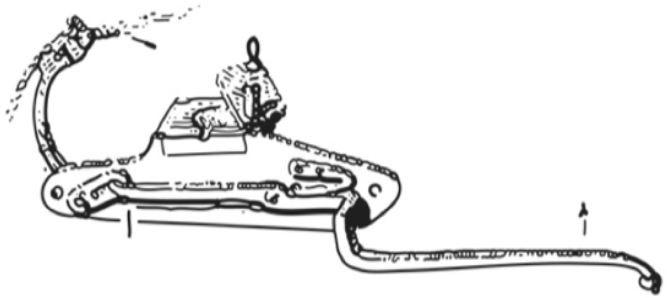
- Ballistic evidence helps explain:
  - What type of firearm was used
  - The caliber of the bullet
  - The number of bullets fired
  - Where the shooter was located
  - Whether a weapon was fired recently
  - If a firearm was used in previous crimes

History of Gunpowder and Firearms

- Chinese invented gunpowder over a thousand years ago
- Muzzle – loading matchlocks used wicks to ignite the gunpowder
- Flintlock weapons used a spark from a chip of flint



Very old matchlock gun



The inside of a matchlock

Percussion Firing Weapons

- Cartridge - holds bullet, primer powder, gunpowder
- Hammer hits primer powder which ignites the gunpowder
- Breech loading is faster than muzzle loading

Long Guns and Hand Guns

- Long guns
- Rifles fire bullets
- Shotguns fire pellets (shot) or a single projectile (slug)

Long Guns and Hand Guns

- Handguns
  - Pistols are fired with one hand
  - Revolvers have a cylinder that holds usually six cartridges

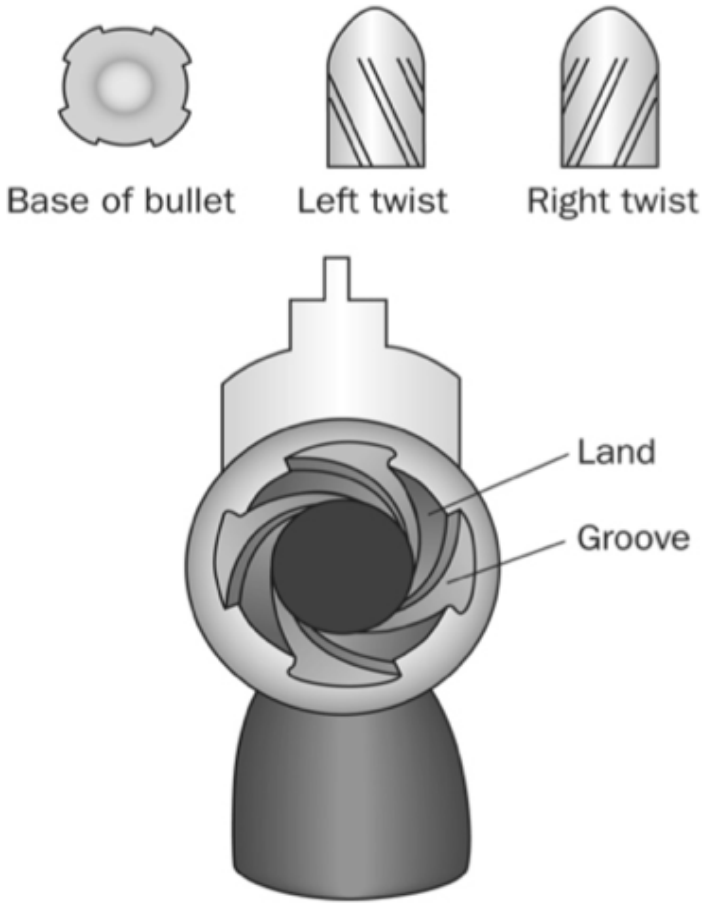
Long Guns and Handguns

- Semi-automatic – 10 cartridges into a magazine/clip
- Fires one bullet per pull of trigger

- Automatic– fires repeatedly as trigger is

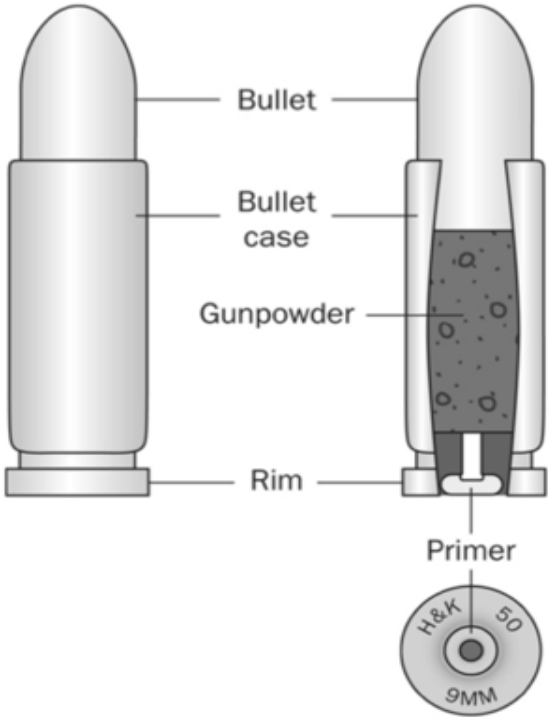
Firearms and Rifling

- Grooves and ridges (lands) in the barrel of a gun produce the twisting that adds accuracy
- This leaves a pattern on the bullet that is unique



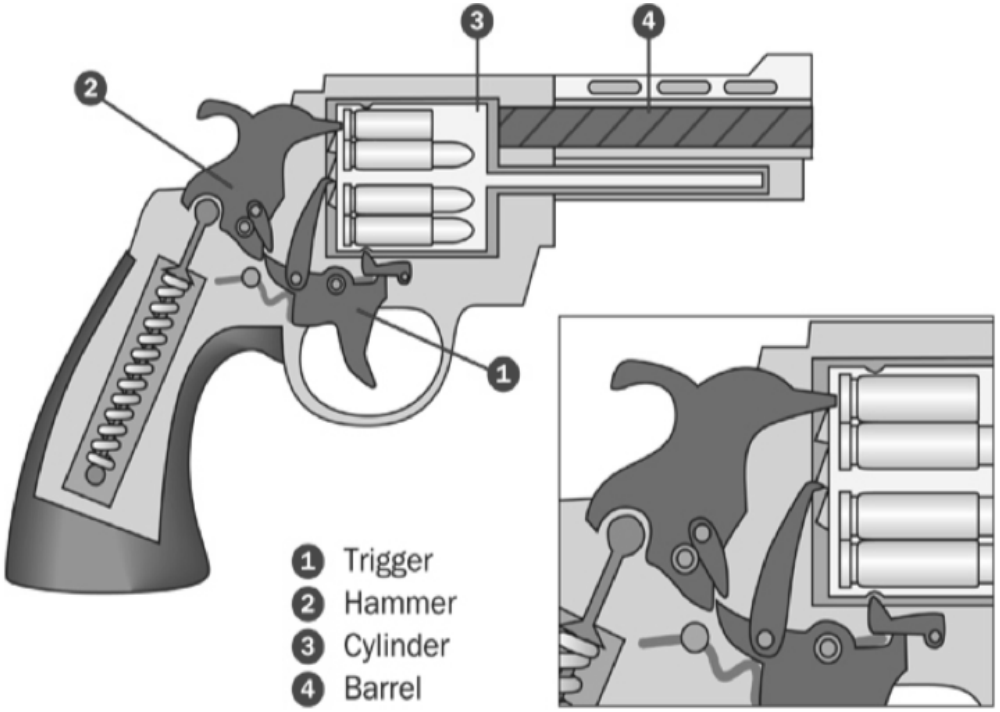
Bullets, Cartridge, and Caliber

- Cartridge - a case that holds a bullet, primer powder, and gunpowder
- The bullet, usually of metal, is out front with the cartridge, holding the primer and propellant powders, behind.



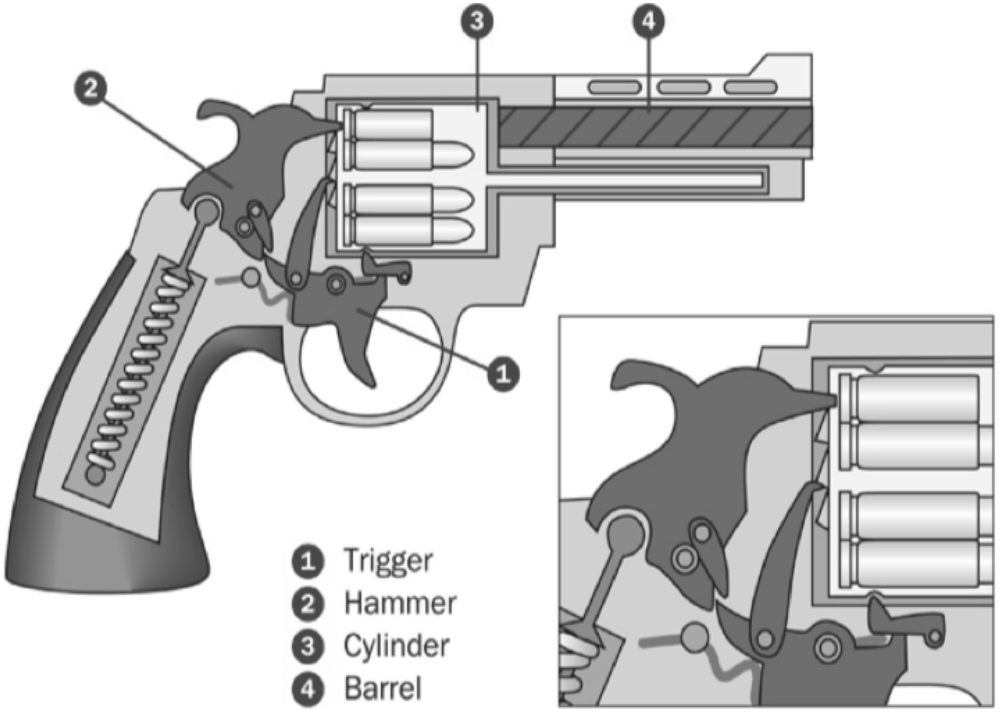
How a Firearm Works

(1) The firing pin hits the base of the cartridge, igniting the primer powder



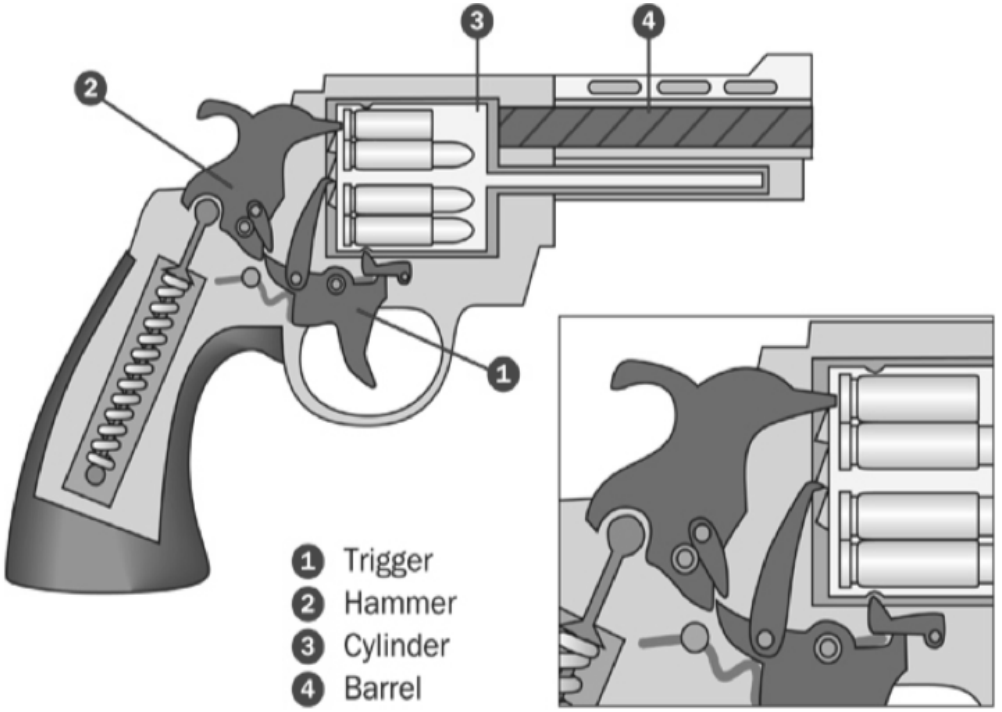
How a Firearm Works

(2) The primer powder <u>sparks</u> through the flash hole to the main propellant supply



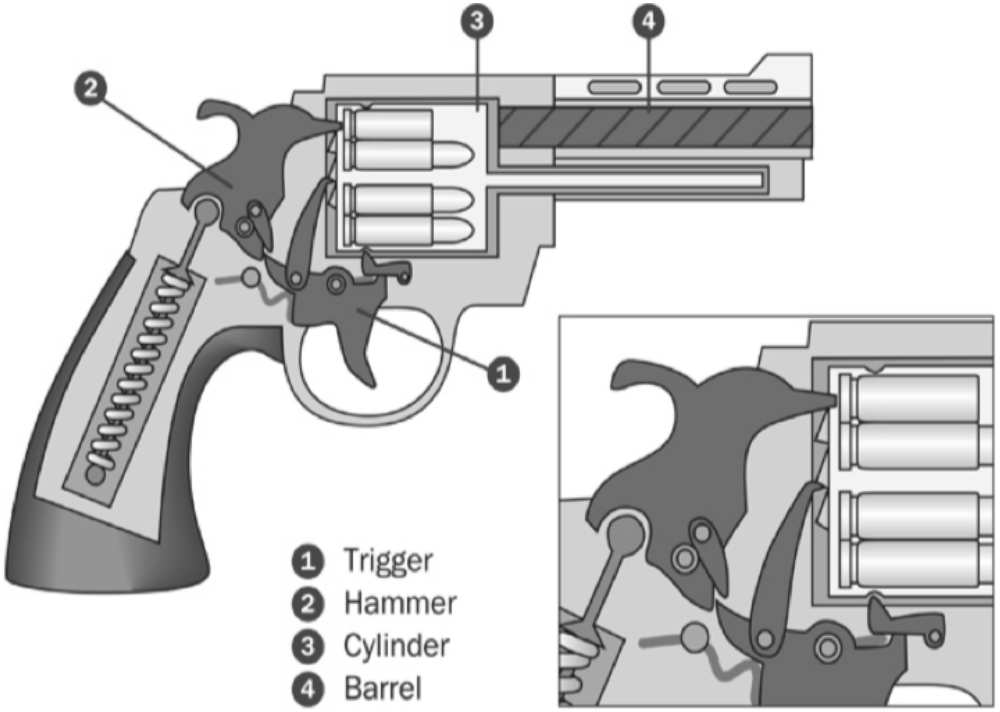
How a Firearm Works

(3) The pressure of the explosion pushes the bullet from the casing into the barrel



How a Firearm Works

(4) The bullet follows the lands and grooves spiraling out of the barrel



Caliber of the Cartridge

- Caliber - a measure of the diameter of the cartridge
- In hundredths of an inch
- Common calibers include
  - .22, .25, .357, .38, .44, and .45

Question: Why should the caliber of ammunition match the firearm that shoots it? If they do not match, what could go wrong?

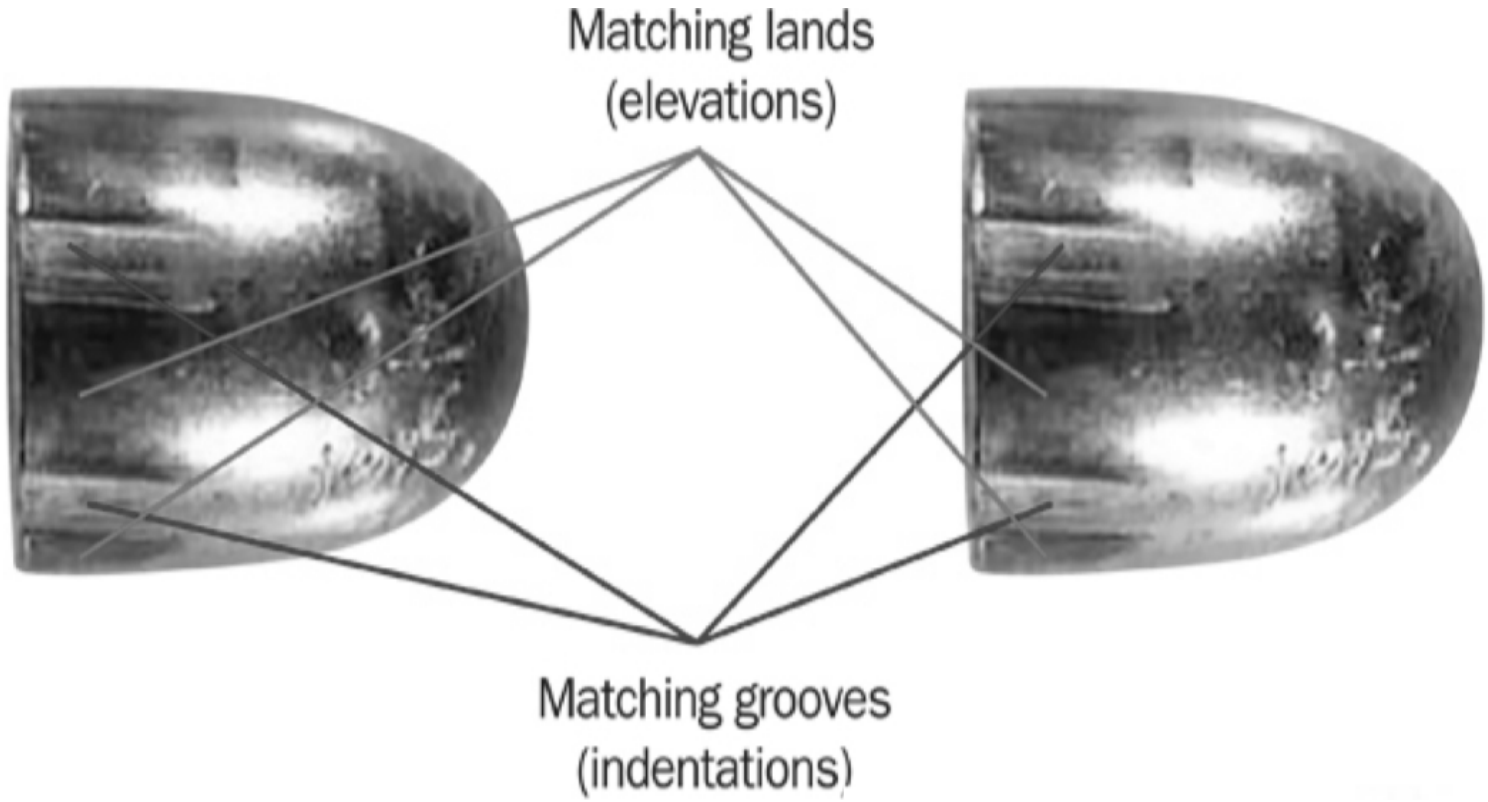
- Discuss this this your neighbor! Write down your thoughts AND their thoughts
  - I think:

    _____

    _____
  - My neighbor _____ thinks:

    _____

The Study of Bullets and Cartridge Casing



Matching Bullets

- Gun is "test-fired" into gel or water
- Doesn't damage bullet
- Marking are compared to suspect's weapons, bullets, casings.

Marks in the Spent Cartridge Casing

- Firing Pin Marks
  - Appear on the rim or center of the spent cartridge
  - Can be used to match a cartridge to a firearm
- Breechblock marks
  - Produced when the cartridge casing slams backward and strikes the breechblock
- Extractor marks and Ejector Marks
  - Only in semi-auto and automatic weapons
  - Small scratches

Gunshot Residue

- Gunshot Residue (GSR)
  - Particles of unburned powder and traces of smoke
  - Leave traces on the hand, arm, face, hair, or clothing of the shooter and/or victim
- Chemical testing can detect residue even if removal is attempted
- Distance from victim to shooter can be determined by examining the residue pattern on the victim

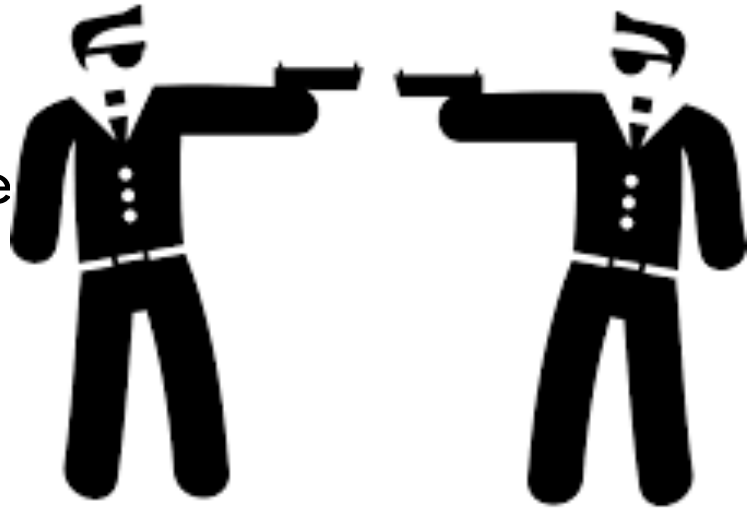
Question: Do you think there is a relationship between the distance between the victim and shooter and the amount of gunshot residue? What do you think that relationship is? Discuss with your neighbor.

Bullet Wounds

- Can show what during the crime
  - Was the victim running away?
- Entrance wounds are smaller than exit wounds
  - Skin stretches as bullet enters
  - As bullet moves through the body it collects tissue

Bullet Wounds

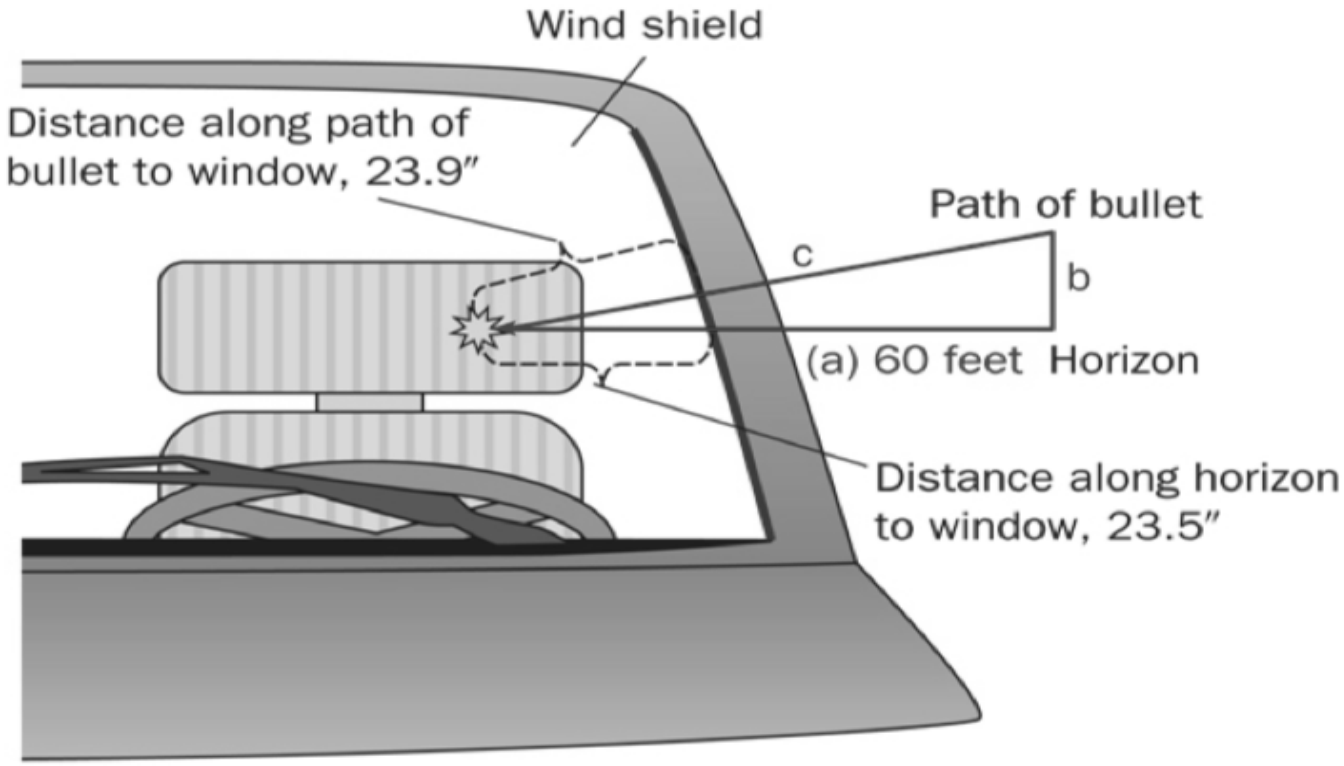
- Fibers may point in the direction the bullet moved
- GSR found near entrance wounds
- Muzzle may burn skin if gun was close
- Small caliber bullets tend to remain lodged in the body



Trajectory

- Two reference points are needed to define the trajectory
- Investigators can figure the shooter discharged the firearm somewhere along that line
- Reference points can be
  - Bullet holes in objects or victims
  - An entry point and exit point on a victim
  - Gunshot residue or spent cartridge casings
- Lasers can trace a straight-line path to determine the position of the shooter

Trajectory


Wind shield
Distance along path of bullet to window, 23.9″
Path of bullet
c
b
(a) 60 feet Horizon
Distance along horizon to window, 23.5″

Trajectory and Gravity

- Bullet's path is slightly <u>curved</u>
- Gravity pulls it downward as the bullet moves forward
- Wind can affect trajectory
- Bullet can hit other objects and ricochet

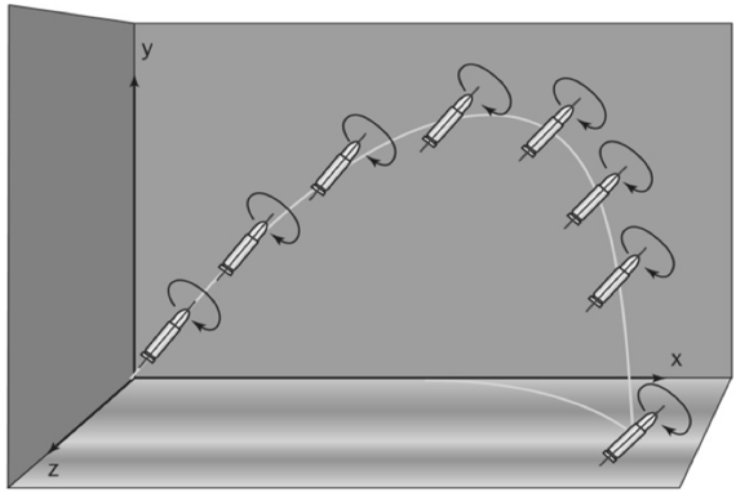


Diagram is highly exaggerated