

# Cause of Death: Guns

Hidden Evidence  
Chapter Eight

February 23<sup>rd</sup>, 2006

# Most common

- What is the most common way to murder someone in the US?
  - Guns
- Possible reasons?
  - Cheap
  - Easy to obtain and to use
  - Allow distance from victim
- Leave a lot of forensic evidence

# Ballistics

- Science of projectiles in motion

Examples:

- Rifles
- Shotguns
- Handguns
- Bow and arrows
- Cannons
- Rockets

# Rifling

- Cutting grooves into the barrel of a gun
- Similar to a screw's thread
- This allows the firearm to impart a spin to a projectile
  - The bullet
- Reason for rifling:
  - Prevents bullet from tumbling
  - Stabilizes bullet and increases accuracy
  - Also increase range that bullet can travel

# Before Rifling

- Smooth bore guns
  - Usually muskets
- Bullet emerges from gun and force of ejection can push bullet in any direction
  - Inaccurate
- Also, bullet did not travel very far
  - Short range
- Weapons could only be used at close range

# Identifying the bullet

- Rifling imparts an individual identity on every gun
  - Grooves and Lands
- Because bullets are made of softer metal than barrel of the gun
- The rifle marks remain on the bullet's casing after being fired
- Every bullet that is ever fired from same gun will have identical rifle marks

# Identifying the Cartridge

- Charge of the bullet is held within the cartridge casing
- In addition to the rifling marks on the bullet itself each gun also imparts specific marks on the cartridge casing as well
  - Firing pin contact point
  - Imperfections in the “breech”
- Any spent cartridge ejected from same gun will bear identical marks

# Make and model of weapon

Guns are classified based upon:

- Who makes the gun
  - Smith and Wesson, Colt, etc
- Model of the gun
  - Rifle, shotgun, handgun, etc
  - Double action or single action
- Caliber of the gun
  - Diameter of the gun barrel

# Make

Who produces the weapon

- Rifling patterns are very specific to gun manufacturers
- Colt
  - 6 grooves, anti-clockwise turn
- Browning
  - 6 grooves, clockwise turn
- Smith and Wesson
  - 5 grooves, clockwise turn

# Model

Type of gun:

- Rifle, shotgun, handgun
- Single action
  - User needs to pull back the hammer to load
  - Then pull the trigger to fire
- Double action
  - Pressing hard on the trigger will cock the gun
- Automatic
  - Automatically loads barrel, just pull trigger

# Caliber

The diameter of the gun's barrel

- Also can be used to describe the size of the bullet because they will be the same
- Usually expressed in 100<sup>th</sup>s of an inch
- .45 = 45/100 of an inch
- Or can say 45 caliber
  - Same thing

# Firearm Fingerprints

- Positive identification of the exact weapon used at a crime scene can also be done
- Internal surface of the barrel carries fine lines and scratches
- In both grooves and lands of barrel
- Caused by surface defects in tools used to manufacture gun
- Completely unique to every gun barrel

# Matching the Fingerprint

- Fire a test bullet from suspect gun
- Then use comparison microscope
- Look at the evidence bullet and compare exact markings to test bullet
- Same gun will make identical marks
  - Especially if test bullet taken soon after crime
- Once align bullets every surface around the diameter will align together

# New York Bureau Forensic Ballistics

- Founded in 1923
- By Waite and Gravelle
- Collection of standard guns:
  - Makes, models and caliber
  - Rifling patterns
- Developed the idea of using comparison microscope
- Helixometer
  - Examine the inside of a gun barrel

# Comparison Microscope

- Two stages
- Hollow bullet holders in each stage
- Each holder can be rotated independently
- Computer screen shows magnified surface of each bullet side by side
- Can rotate bullets until they are aligned
- Then rotate both together to find further points of resemblance

# Imperfect Match

Not always possible to establish a perfect match between gun and bullet

- If barrel was dirty or rusted
  - Especially if it was cleaned afterwards
- If many bullets have been fired or many years have passed since crime
  - Barrel may change with wear
- If bullet is distorted
  - Passed through bone or some obstruction

# Shotguns

- Does not fire a single bullet
- Fires a cartridge filled with shot
  - Small lead pellets
- Shot disperses as it flies through the air
- Usually need to be reload after every shot
  - Completed by “breaking” shotgun
  - Open the breeches
  - Remove cartridges and reloading with new

# Shotguns

- Single barrel
  - One barrel per gun
- Double barrel
  - More commonly – have two barrels
- Pump action
  - Several cartridges are in a magazine
  - Pump a slider back and forth to eject used and reload next cartridge
- Sawed off
  - Length of barrel is shortened – easier to carry

# Rifles

- Long barrel
- Often held with two hands or against shoulder
- Use a bolt action to reload
- Slide bolt back and forth like a pump action shotgun
- Automatic rifles – just pull trigger
  - Usually for military use

# Handguns

- Short barrel – fits into one hand easily
- Revolver
  - Cylindrical magazine – moves around
- Pistol
  - Clip or rectangular magazine
- Single or double action
- Automatic pistols
  - Gun's internal mechanisms do everything

# Other Projectiles

- Air guns or air pistols
  - Advantage is that they are very quiet
  - Disadvantage is they have less power
- Bow and arrow
- Crossbow
- Rockets
- Cannons
- Etc...

# Gunshot wounds

From the wound can determine:

- Range
  - Distance between gun and victim
  - Scorch marks
- Direction of shooter
  - From the shape of the wound
- Entry or exit wounds
  - Exit wounds are larger than entry wounds

# Range

- Distance between gun and victim
- Determined from:
  - Amount of scorching of the skin
  - Amount of gun powder in wound
  - Any clothing surrounding wound
  - Size and shape of wound
- Determining range is vital for reconstructing the crime scene
  - For example - impossible to be a suicide

# Scorch Marks

- If gun is held at right up against skin

Point blank range

- Gases and soot particles will be driven into the skin of the victim
  - Cause burning of the skin around the wound

If gun is not touching skin but still close

- Leave a wider ring of discolored skin
  - Burning of skin is less severe

# Powder Residue

Weapon fired from further range

- Gun powder will be driven into the skin
  - “Tattooing”
- Victim was alive when shot:
  - Tattooing orange or brown
- Victim was dead when shot:
  - Tattoo more subdued – grayish yellow
- Clothing will show clear pattern of gun powder residue

# Powder Residue

12 to 18 inches

- Soot will be present around wound

18 to 24 or 36 inches

- Scattered grains of gun powder further out surrounding wound

Further than 3 feet

- Dark ring - “Bullet wipe”
- Immediately around entry wound

# Range determine from clothing

If the wound was inflicted through victim's clothing:

- Gun powder will leave clearly visible pattern on material
- Most accurate determination of range:
  - Fires the suspect weapon through same or similar clothing
  - From different distances
  - The range which leaves the same pattern is more likely range

# Shape of wound

- If the gun is aimed straight at the victim then the wound will be circular
- If gun is angled in relation wound will be oval
  - Longest axis will be along the angle the gun was held towards the victim
- This may help determine the circumstances surrounding the shooting
- Also may help determine range

# Exit vs. Entry wounds

- Exit wounds are bigger than entry wounds
- Entry wound
  - Small, circular or oval
- Exit wound
  - Bullet may have been distorted while in body
  - Large
  - Irregularly shaped
- Can determine direction of the gun – position of the victim and attacker

# Shotgun wounds

Degree of the spread of the spray of the pellets can determine range

- Closer together – closer range
- Spread out – farther range
- Depends on the amount of choke
- Choke:
  - Constriction of the gun's barrel
  - Extends the range by reducing the spread

# Gun Powder on Suspect

- Firing a gun will also eject some gun powder residue onto the shooter as well
- Onto their hands
  - Also on clothing
- A wipe of a suspect's hands
  - Especially if taken shortly after
- Will show evidence of:
  - Gun powder itself
  - Chemicals that ignite gun powder

# Types of bullets

Shape of bullet:

- Round nosed or sharp nosed

Core of bullet:

- Lead or steel core

Specialized bullets:

- Hollow point
  - Bullets will expand upon impact
- Armor piercing, bullets with tracers

# Types of cartridges

- Shape and design of cartridge can be linked to mark and model of a gun
- Also linked to exact type of bullet used

Position of primer cap:

- Centered or around the rim of the case

Shotgun cartridges

- Comprised of a charge and cap
- But then filled with shot rather than a bullet

# Summary of Evidence

- Finding bullet or bullet wound
- Matching rifling marks on bullet to gun:
  - Type of gun used
  - Matching exact gun used
- Determine range between gun and victim
  - Scorch marks, gun powder residue, clothing

# Suicide or Murder

- Man is found dead in his home
- Holding a shotgun
- Ballistic evidence showed this was the shotgun that killed him
- Looks like a suicide
- Autopsy shows the range is too far for this to be a suicide
- Impossible for him to have held the gun at that distance

# Sacco and Vanzetti

- April 15<sup>th</sup>, 1920
- Two men robbed a bank and killed guards
- Cartridges from the scene matched to three different manufacturers:
  - Peters, Remington and Winchester
- Police raided a house identified from the getaway car
- Found two men matching witnesses descriptions

# Sacco and Vanzetti

- Both men carrying loaded weapons
- Sacco's was same caliber as at the crime scene - .32
- In his pocket he had cartridges from:
  - Peters, Remington and Winchester
- The bullets identified from the crime scene were so old they could not be bought again for test bullets

# Sacco and Vanzetti

- Forensics ended up using the bullets Sacco had in his pockets as test bullets
- Match was close enough that they were both found guilty
- Reasonable doubt was raised and a retrial began
- Helixometer was used to prove that the barrel of Sacco's .32 matched the bullets from the crime scene
- Both men went to the Electric Chair

# Georgi Markov

- Bulgarian dissident living in London during Communist Eastern Europe
- September 7<sup>th</sup>, 1978
- Waiting for the bus in London
- Felt a stabbing pain in his leg
- A man with a closed umbrella said he had accidentally hit Markov
- Mumbled an apology and walked away

# Georgi Markov

- Next morning Markov was vomiting and running high fever
- Hospital x-rayed wound and found nothing
- Markov died 4 days later
- Autopsy found a tiny pellet in his leg
  - Size of a pinhead
- Two tiny holes – but they were empty
  - Poison had dissipated

# Georgi Markov

- Pellet was made of platinum and iridium
- Invisible on an x-ray
- Because Markov didn't hear a sound they determined he must have been shot with a gas operated gun hidden within the umbrella
- Poison was discovered to be Ricin
- Later Bulgarian government admitted assassinations

# USS Iowa

- USS Iowa is a battleship
- April 19<sup>th</sup>, 1989
- 47 sailors died when some explosives being loaded into the gun turrets exploded
- Navy suspected sabotage
- Further research showed that the mechanism of the gun turret was faulty
- Pushed the charge up too far and too fast

# Next Class

- Tuesday February 28<sup>th</sup>
- Exam Two
- Review five chapters:
  - Hidden – 4 through 8
  - Causes of death
  - Plus ALL lecture notes