# Honorable Judicial Officers from Bangladesh

# FORENSIC EVIDENCE IN CIVIL AND CRIMINAL TRIALS; DNA PROFILING

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# Burglar rapes Spanish woman at knifepoint in Bandra flat

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*Burglar raped Spanish woman at knifepoint in her 2nd flat*

MUMBAI: A bizarre night of house break-ins in a posh locality of Bandra deteriorated into a nightmare for a young expat woman when the thief turned into a predator and raped her twice at knifepoint before fleeing with her money and undergarments.

A police first information report has been lodged and sketches of the accused are being circulated to police stations. The 27-year-old Spanish woman, who came to Mumbai on a scholarship to learn music, also takes private classes. She was alone at home on Monday as her flat mate was travelling.

Around 2am on Monday, the thief first tried to enter a bungalow on Perry Cross Road, but ran away after a worker inside spotted him. The worker saw him enter the adjoining building and went back to work. The culprit then proceeded to rob a senior citizen in that building before entering the house of the Spaniard in a nearby building.

The thief shinned up a drain pipe and entered the third floor flat where she has been residing for four months through an open window. The man, who had partially covered his face with a handkerchief, woke her up and, brandishing a knife, asked for "gold", the victim told the police. She jumped out of bed, and managed to run out and knock on her neighbour's door. But there was nobody inside. The thief dragged her back into the flat and raped her.

He again asked her where her valuables were and, rummaging around, found some foreign currency. He settled down with a cigarette he found near the victim's bed and then raped the woman again.

After this, she asked to be allowed to use the toilet. Once in, she locked it and began screaming for help.

The watchman of the building told the police that he heard the screaming, but assuming that it was coming from some other building, did not follow up on it. She screamed for over an hour before a maid, who was passing by, informed the police.

Roshan Reporter, secretary of the Perry Cross Road (north) Residents' Association, said around 4am she heard someone screaming in the next building. 'Help me, call the police'. "When I opened the window, several people had gathered and the police had been informed. The fire brigade came and broke open her flat door before the police could enter."

The thief, hearing his victim screaming, closed the main door from outside and quietly left the building. "The accused seems quite shrewd as he took care not to leave any piece of evidence behind. He has taken the victim's undergarments and night gown along with him," said a police officer on condition of anonymity. Sources said in a rape case, the undergarments are a crucial piece of evidence.

The police could not enter the flat initially as the terrified victim wouldn't come out of the toilet. After the fire brigade broke open the main door, they convinced her that they were cops and persuaded her to open the bathroom door. A special team of crime branch officers has been set up to crack the case on a priority basis. The officers are going through the list of history-sheeters and have also announced a cash reward for any information on the suspect.

'A person saw the accused at the bungalow but unfortunately he didn't inform the police. Otherwise, this incident could have been avoided. More unfortunately, the victim ran out of the house and knocked on a neighbour's door, but no one was there," said additional commissioner of police (west region) Vishwas Nangre-Patil, whose office is close to the area of the house break-ins.

An burglar wearing gloves in his hands, a black denim jeans and 10 no shoes with the intention of robbery entered in a flat on third story of an apartment with the help of a pole through a window, by breaking its glass in the night time. During his attempt some of the glass pieces wounded the person leading to discharge of his blood near the window and some glass pieces entered in his shoes and shoe prints formed over the floor.

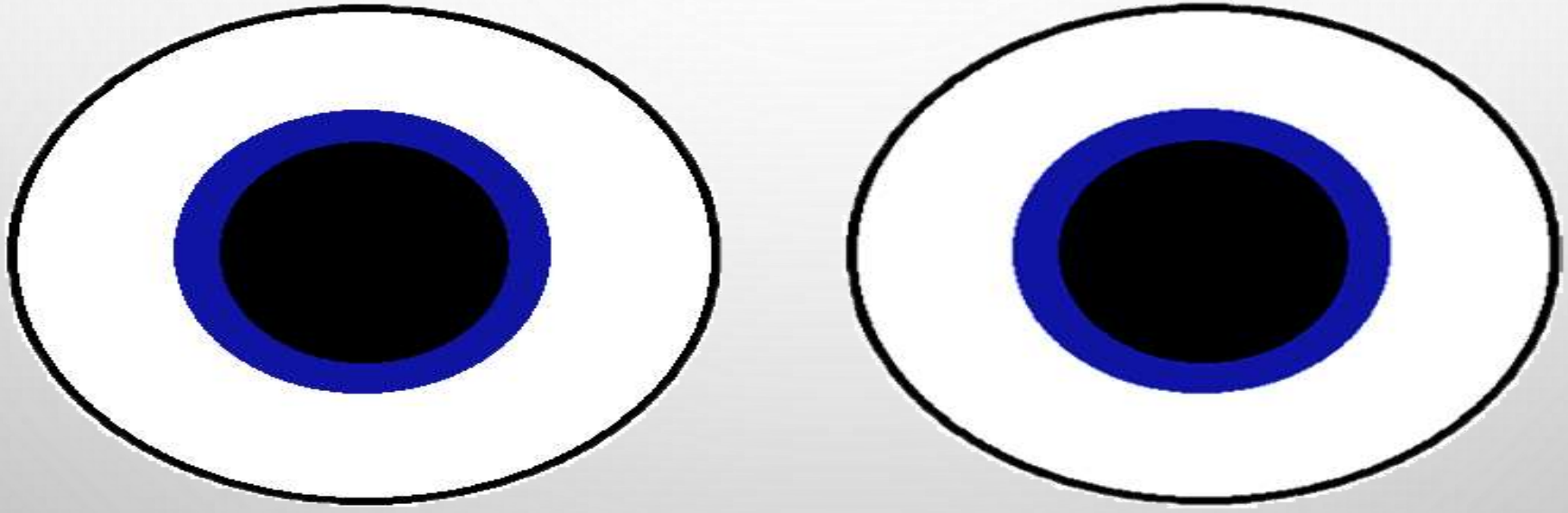
The occupant of the flat was an unmarried young college going girl who was alone at that time. The burglar threatened the girl with a knife and inflicted some minor wounds over the body of the girl so she bled in her clothes and he also tore her clothes. Under this threat, he raped the girl twice, smoked a cigarette in between, thrown it on the floor, rob all of her valuables and ran away by a car brought and parked by him near the apartment.

The security guard noticed that suspicious person while removing and throwing hand gloves and escaping, noted the car registration number and informed the police about the same.

The police vehicle chased that car, however during encounter in the exchange of firing, the person died due to bullet injury over his head but all the valuables and undergarments of girl were recovered. The body was sent for the postmortem examination in the mortuary of a hospital. The police have taken the girl for medical examination to the hospital and collected the report and also recovered CCTV footage from the girl's apartment.

What all kind of things can be collected as evidence to prove this case???

# “You can observe a lot by just careful watching”



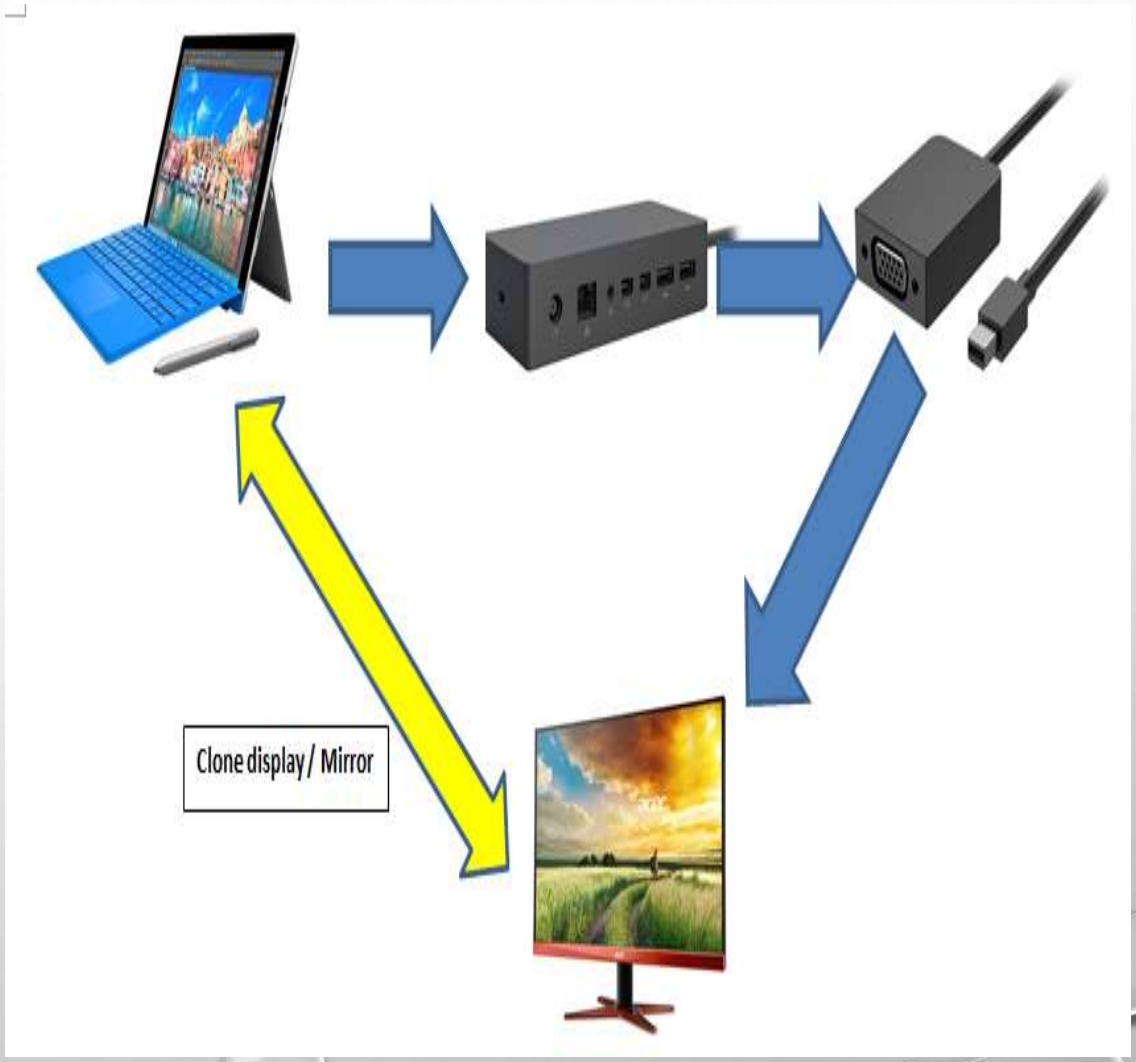
# Evidences

*(Crime scene: Girls apartment and the place where exchange of fire took place)*

1. Black denim jeans,10 no shoes,hand gloves
2. Glass pieces
3. night time
4. Blood &seminal stains
5. shoe prints
6. Fingerprints
7. Knife
8. Clothing
9. Cigarette
10. Security guard
11. Car
12. Valuables & undergarments in the car
13. Bullet and firearms
14. Dead body
15. Medicolegal examination and PM report
16. Seminal stain
17. CCTV footage

# COMPLEX


BEFORE
AFTER


Clone display / Mirror


- The parts of a legal case which are not in controversy are known as the "facts of the case."
- They indicate whether a belief or proposition is true or invalid.

- In law, rules(IEA act 1872) govern evidences that are admissible in a legal proceeding.
- Types of legal evidence include testimony, documentary evidence, and physical evidence.
- Prove or disapprove a fact

# Documentary evidences

- S.61-90 of IEA deal with it

- Medico legal case examination/postmortem/expert reports

- Such reports describe:

1. All relevant and convincing facts observed
2. Opinion drawn from facts

- Testimonial Evidence
  - Statement made under oath
  - What is said in court by a competent witness
  - Also called direct evidence or *prima facie*

- Physical Evidence
  - Tangible items that tend to prove some material fact
  - Aka *real evidence*

# Civil Cases

- **A civil case** is a lawsuit that usually deals with contracts and/or torts.
- Torts are wrongful (negligent) acts that result in damage or injury.

Examples:

- Insurance claims
- Tort claims
- Breach of contract claims
- Inheritance claims/Paternity tests
- Negligence – Documentation /consent
- Compensation claims
- Age estimation( for consent, retirement etc. )

# Criminal cases

A body of rules and statutes(IPC 1860& CrPC 1973) that defines conduct, prohibited by the government because it threatens and harms public safety and welfare.

**Examples:**

- Homicides
- Suicides/Abetment of Suicides
- Sexual assaults
- Dowry deaths
- Drug abuse
- Assault/ accident cases
- Cases of poisoning including alcohol

# Forensic Science

- Application of knowledge of **science** in the administration of law and justice

- Multidisciplinary and multidimensional

Gives only objective information

**No absolute authoritative solution**

# Forensic medicine

- Application of knowledge of **medical science** in the administration of law and justice.

## Role of Forensic Medicine doctor in India

•**Application of science** and proper interpretation of scientific findings **to a medico-legal controversy**

•The sole obligation is **to present the truth as seen** without adding & distorting nothing

•The fact issues related with **the cause, time since death and manner of death** rather than the ultimate issue of guilt or innocence are presented

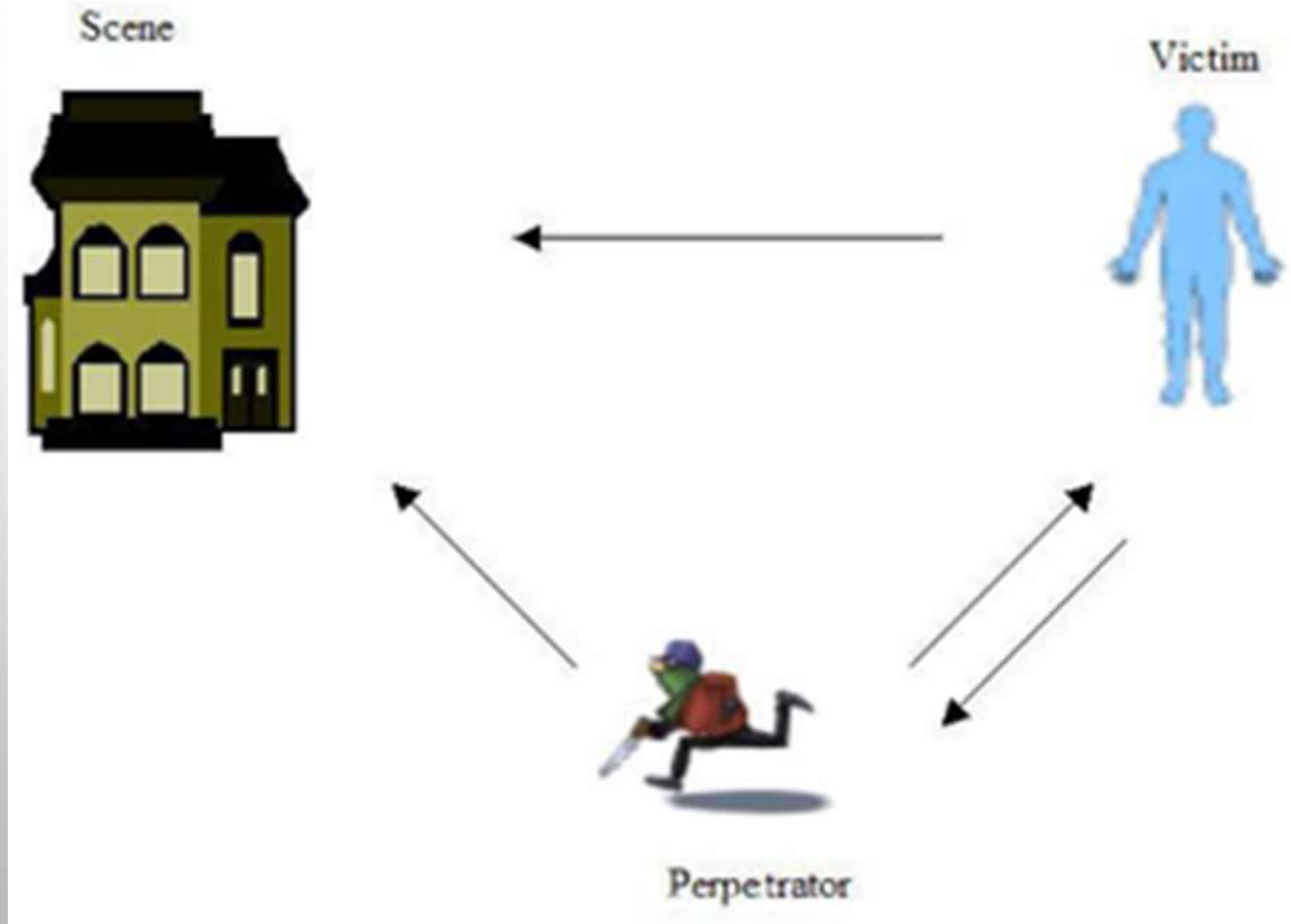
- The opinion given is based upon reasonable medical certainty

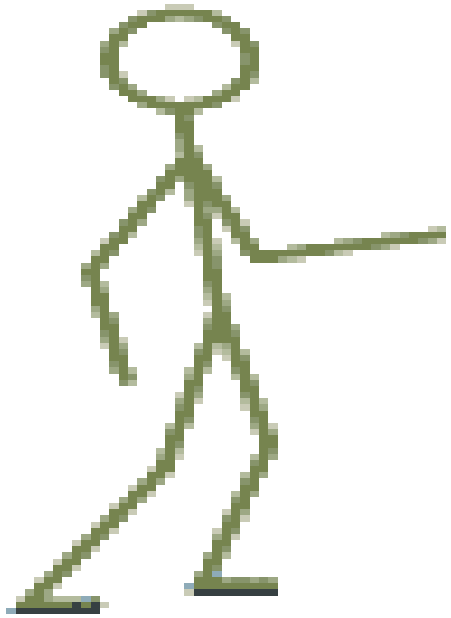
- The evidence of Forensic Medicine doctor is only an opinion which is corroborative

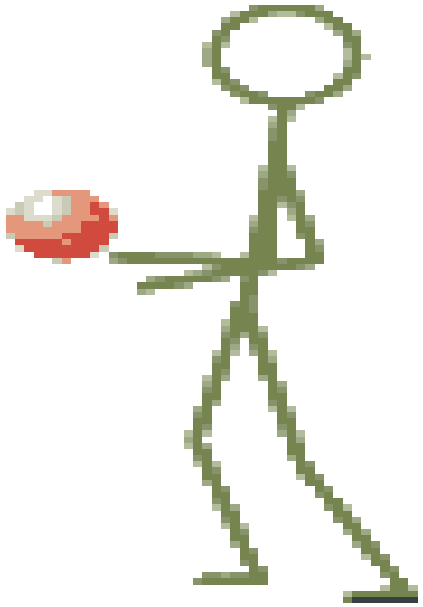
- It doesn't prove the case of prosecution but better the presentation, better is the administration of justice

# Forensic evidence

- It is type of **evidence,** obtained by scientific methods during crime scene investigation, medicolegal/wound examination, ballistics, or autopsy etc. and is used in the court of law.

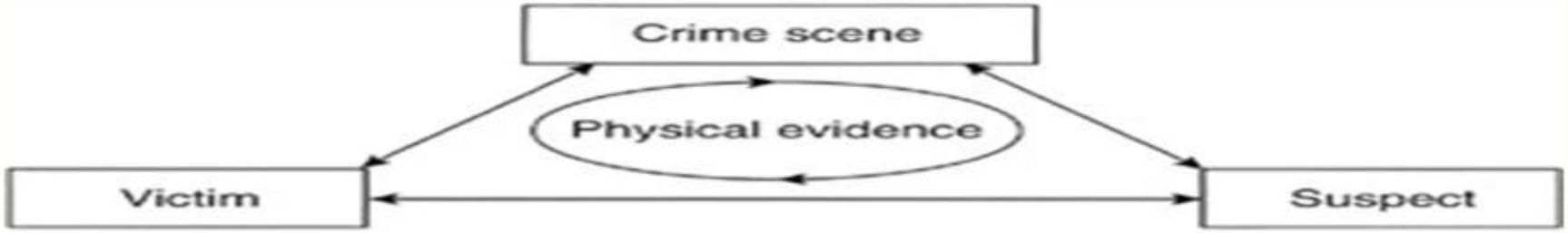

Scene
Victim
Perpetrator





# Locard's Exchange Principle

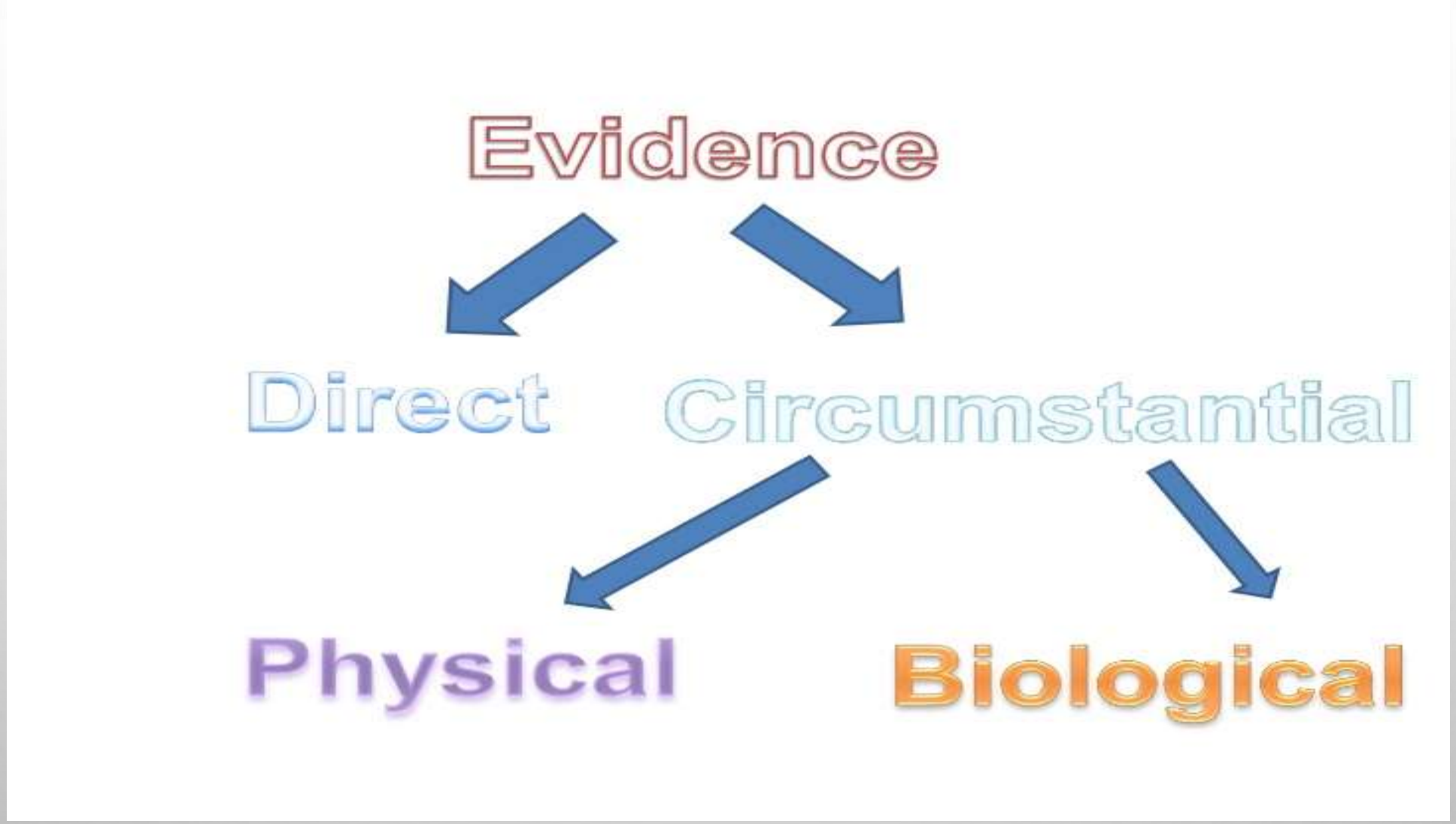
- "...with contact between two items, there will be an exchange."



# Physical Evidence

"Wherever he steps, whatever he touches, whatever he leaves even unconsciously, will serve as silent witness against him. Not only his fingerprints or his footprints, but his hair, the fibers from his clothes, the glass he breaks, the tool marks he leaves, the paint he scratches, the blood or semen he deposits or collects -- all of these and more bear mute witness against him."

—Dr. Edmond Locard


Evidence
Direct
Circumstantial
Physical
Biological

# Physical Evidence

- Real evidence
- Tangible items to prove or disapprove a fact
- Material item or object at crime scene, body of victim or in possession of perpetrator
- They can be as large as building, small as hair ,fleeting as smell or microscopic as DNA

**We are most interested in such items**

# Examples of Physical Evidence

- Imprints
- Broken glass
- Hairs
- Fibers
- Paint chips
- Documents
- Fingerprints
- Other prints (shoe, tire, etc.)
- Body/corpse
- Toolmarks/firearms
- Bullets/casings
- DNA
- Blood
- Semen
- Drugs, chemicals
- Soil

# Types of Specimens

- **Biological samples include**:
  - Blood,
  - Urine,
  - Hair,
  - Nails,
  - Saliva,
  - Tissues and
  - Exhaled breath.

**Non-biological samples include**:

- ✓Unidentified pills,
- ✓Powders,
- ✓Liquids, and
- ✓Gases.

# Not all evidence is permanent…

- **Transient evidence**
  - Temporary evidence
  - Can be easily changed or lost
  - Usually observed by first officer on scene and must be recorded at that time
- Examples?
  - Odors
    - Perfume, cigarette smoke, gas
  - Temperature
    - Coffee pot, car hood, water in bath tub, dead body
  - Imprints
    - Footprints in sand, fingerprints in dust, teeth marks in perishable food


WHY
WAIT?


ACT
NOW!

# Conditional

- Evidence produced by specific action or event at the scene
- Must be observed and recorded

e.g. Condition of window,light,position of furniture or body,10 no.shoe mark near window

# Indirect evidence

- Doesn’t prove or disapprove a fact in question
- Basis for inference about a disputed fact
- In possession of controlled substance seen by someone

e.g. someone has seen other in possession of knife or valuable

# Circumstantial

- Evidence based on suggestion rather than person knowledge
- Implies a fact without proving it
- e.g. Door is bolted from outside or inside suggestive of homicide or suicide

# Value of a physical evidence

- Prove or disapprove a fact
- Backup the testimony
- Linking of suspect, victim and perpetrator
- Determine identity of a person
- Help in reconstruction of crime scene

- Physical Vs Nonphysical

- Material items vs verbal testimony/action

- Example: someone has seen a burglar  running away after bank with bag of money at his shoulder.

- Bag money-physical evidence

- Action of running away-nonphysical evidence

# Real Vs Demonstrative

- Real –generated at crime scene-e.g. fingerprints, bullet etc.
- Demonstrative –created to explain real evidence e.g. dummy 3 D model, sketches, charts

# Known Vs Unknown

**Source-unknown e.g. Bullet found in body**

**Source-known e.g. Blood collected from burglar's body during autopsy**

# Individual Vs Class

- Individual-specific to a person e.g fingerprints
- Class-common to a group-e.g. Denim fibres from a pant, 10 no shoes

# Types of evidences in case :

- Broken window & pole near window (Circumstantial evidence)
- Door found locked from outside and that of toilet from inside (Circumstantial evidence)
- Glass in window (Known physical evidence)
- Fingerprints on glass in window (unknown individual evidence)
- Glass on floor (unknown physical evidence)

- Night time and presence of girl alone (conditional evidence).
- Blood near the window (unknown biological evidence)
- Glass pieces in shoes. (unknown physical evidence)
- Knife (weapon-physical evidence)
- Blood stains on knife (unknown biological evidence)

(Conti….)

- Examination report of girl & PM report of burglar(documentary evidence)
- Seminal stains(Unknown biological evidence)
- Blood  of girl in her clothes(unknown biological evidence)
- Clothes of girl and burglar(known physical evidence)
- Smoked cigarette (unknown physical &biological evidence)
- Car (physical evidence)
- Valuables and knife in the car(circumstantial evidence)

- Security guard(Indirect evidence)
- Bullet recovered from his head(unknown physical evidence)
- CCTV footage & eye witnesses (Direct evidence)
- Denim jeans & 10 no shoes(class evidence)
- DNA fingerprints (Individual evidence)
- Sketches by police (demonstrative evidence)

# Individual Evidence

| Evidence Type | Individualising Test |
| --- | --- |
| Fingerprints (also palm prints and footprints) | Comparison of minutiae with known. |
| Handwriting | Comparison with known handwriting |
| Bullets and casing knowns | Comparisons with markings or |
| Shoe prints and tire treads | Comparison details with known |
| Large pieces of paint, glass or paper | Fracture match or tear match comparison with known. |

# Forensic Labs Categories

1. Central FSLs
2. State FSLs
3. Mini & Local FSLs

# The Organisation of a Forensic Science Laboratory

- Headed by a scientist designated as Director; assisted by scientists at different levels – Deputy Directors, Assistant Directors, Scientific Officers and technicians.
- Generally the lab is divided into divisions headed by Deputy Directors or an Assistant Director.
- All officers of the lab are empowered to undertake examination of case exhibits and submit reports to the court through the Director.

# The Units in a Forensic Lab

## 0) Case Receipt Unit

- Taking over of case exhibits and handing over reports.

- The sealed parcels are accepted after examining seals, the condition of the packet and the forwarding letter.

- Sample in the parcel sent to appropriate divisions for analyses.

- After lab examinations, the leftover portions of the samples are forwarded to this unit to be returned to the police.

# 1) Biology Division

- Deals with biological materials like blood, semen, saliva, hair etc.
- Also undertakes examination of skeletal remains to find out species of origin, race, sex, age, stature of the bio materials.
- Identifies dried bloodstains and body fluids
- Compares hairs and fibers
- Identifies and compares botanical materials such as wood and plants

# 2) Serology Division

- Created as a result of the ever increasing load of serological examinations.
- Responsible to find out the species of origin, blood group substances, enzyme, serum protein etc in the biological materials such as blood, semen, saliva, epithelial cells, tissues, bones, hairs, teeth cavity scrapings etc.
- DNA profiling done here.

## 3) Chemistry Division

- Carries out chemical analysis; both qualitative and quantitative .
- adulterated petroleum, fertilisers, medicines, burnt remains etc.

## 4) Toxicology Division

- Undertakes chemical analysis of all materials related to suspected poisoning; stomach wash, vomit, injection site etc.

## 5) Physics Division

- Analyses building materials like adulterated cement samples, cement-sand proportions, strength of building materials etc.
- Analysis of glass, sand, soil, paint, dirt etc.
- Tool and cut mark identification, restorations of obliterated marks/writings/numbers etc.

## 6) Prohibition and Excise Division

- Analyses samples of spurious and illicit liquors, alcoholic beverages, blood alcohol level etc.

## 7) Narcotics Division

- Samples of all narcotic drugs and psychotropic substances are sent to this division for analysis.
- Also analyses precursor chemicals used for manufacturing drugs and psychotropic substances.

## 8) Document Examination Unit

- Provides the skills needed for handwriting analysis and questioned document issues.
- Also analyses paper and ink, indentations, obliterations, erasures, and burned or charred documents.

## 9) Ballistics/Firearms Division

- Identification of firearms
- Live/fired ammunitions
- Distance of fire
- Correlation between the ammunition and the firearm
- Gunpowder residue analysis

## 10) Explosive Division

- Analysis of chemical nature of material used in an explosion.

## 11) Photography Unit

- Examines and records physical evidence at the crime scene and at suspects' locations

## 12) Latent Fingerprint Unit

- Processes and examines evidence for latent fingerprints i.e. those found on surfaces

## 13) Polygraph Unit

- Uses lie detectors, an essential tool of the crime investigator rather than the forensic scientist

## 14) Voiceprint Analysis Unit

- Involved in cases of telephone threats or tape-recorded messages
- Investigators may be able to connect a voice to a particular suspect

# Other Forensic Science Services

- Forensic Pathology
  - Who is the victim?
  - What injuries are present?
  - When did the injuries occur?
  - Why and how were the injuries produced?
- Primary role of medical examiner is to determine cause of death
  - If undeterminable through observation, then an autopsy is performed
- Manner of Death
  - Natural -- Suicide
  - Homicide -- Undetermined
  - Accident

# Other Forensic Services

## Forensic Psychiatry

- The study of human behavior and legal proceedings in both civil and criminal cases
- In civil and criminal cases, competency often needs to be determined
- In criminal trials, the evaluation of behavior disorders is often required in order to establish the psychological profile of a suspect.

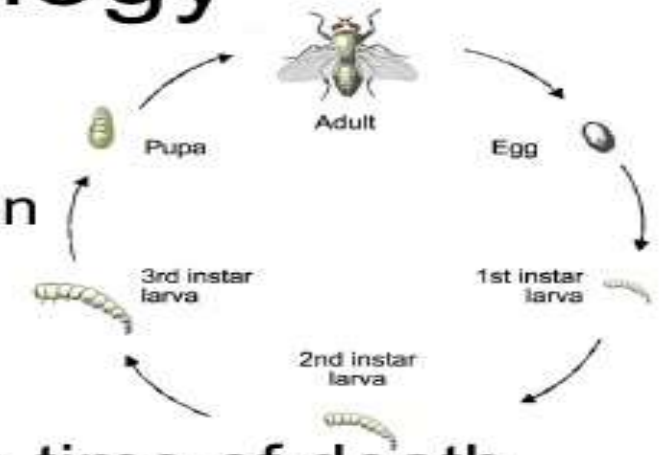
# Forensic Anthropology

- Primarily deals with the identification and examination of human skeletal remains
- Exams can reveal
  - Origin, sex, approximate age, race, and skeletal injury
- Other Skills
  - Facial reconstruction
  - Mass disaster identification

# Sheena Bora Murder Case

# Forensic Entomology

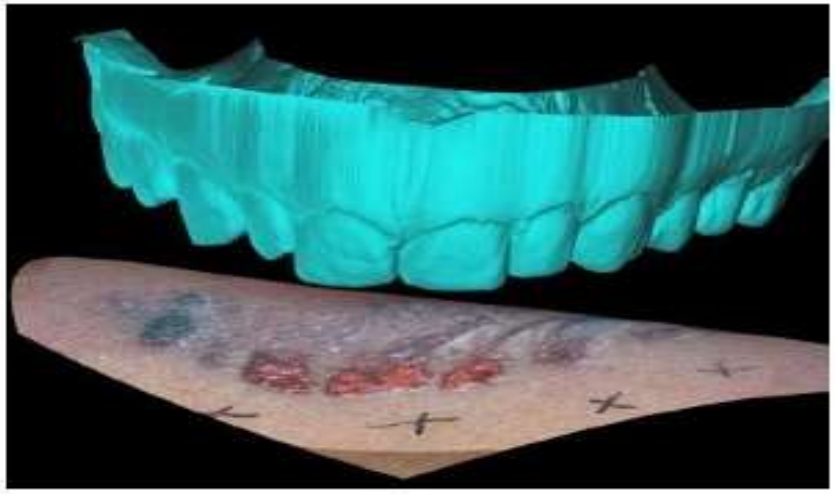
- Forensic Entomology
  - The study of insects and their relation to a criminal investigation
- Uses
  - Estimate time of death




- Forensic entomologists determine time of death by taking the life cycle of certain insects along with environmental characteristics into consideration
- Insects can arrive at a dead body in as little as 20 minutes from the time of death

# Forensic Odontology

- Identification of victims left in an unrecognizable state through:
  - Dental records
  - Smiling photographs
  - X-rays
- Abuse/assault cases, etc
  - Bite marks can link victims with assailant



# Evidence Examples

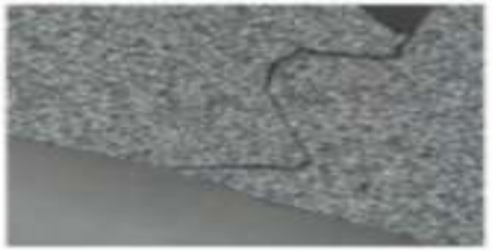
## Paint

- Physical and chemical analysis of paint evidence (chips or residue) can indicate it's class, such as automobile paint, house paint, nail polish, etc. The evidence can be compared to 40,000 different types of paint classified in a database, which can be used to identify a particular make or model of car or brand of tool.

- Paint evidence can also indicate individual characteristics if an investigator is able to find similarities between two samples, such as the color, number of layers, chemical composition, or a physical match between the edges of two paint chips – one from a tool and one from a crime scene.

Paint Transfer on a Car

Paint Layers



Physical Match of Paint Chip Edges

***Did you know?***
*Most paint evidence submitted to a lab will come from hit-and-run cases involving automobiles.*

# Glass

- Glass particles can be found at various crime scenes, such as breaking and entering, hit and run, vandalism, or murder.
- Glass at a crime scene is analyzed to determine its color, surface characteristics, tint, thickness, density, chemical composition, and refractive index (RI).
- The results of the tests provide clues about the crime and help investigators connect the evidence to a suspect or other object used in a crime, such as matching glass from a crime scene to a headlight to a suspect's car.

Magnified image of glass fragments

The pattern of cracks in a windshield fracture can reveal information about speed, occupant position, and angle of impact.

## Explosives

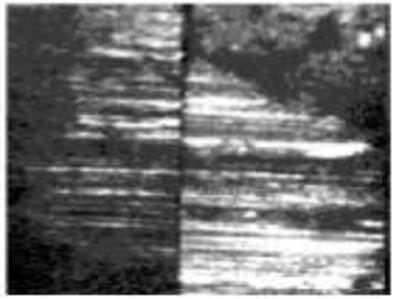
- Explosive substances can be examined to determine its chemical composition to identify the type of explosive used and its origin.
- Traces of explosives found on a suspect's clothing, skin, hair, or other objects may be matched to explosives from the crime scene.
- Materials used to make an explosive device will be compared to evidence found in the suspect's possession to confirm a match.

Pipe Bombs

Chemical Reaction Bomb

## Ballistics

- Characteristics of ammunition, firearms, and residue are examined to find matches between suspects and the evidence found at a crime scene.
- Chemical tests can reveal gunshot residue (GSR) on the hands, face, or clothing of a victim or suspect to indicate how close a person was to a fired gun.
- Rifling (grooves) in a gun barrel causes distinctive grooves, indentations and scratches upon fired bullets, which can be matched to the weapon that fired them.
- Police are able to search the National Integrated Ballistics Identification System (NIBIS) database to compare markings from bullets, cartridge cases, and shotgun shells to ballistic evidence.



Investigators can compare the striations on bullets to see if they match.

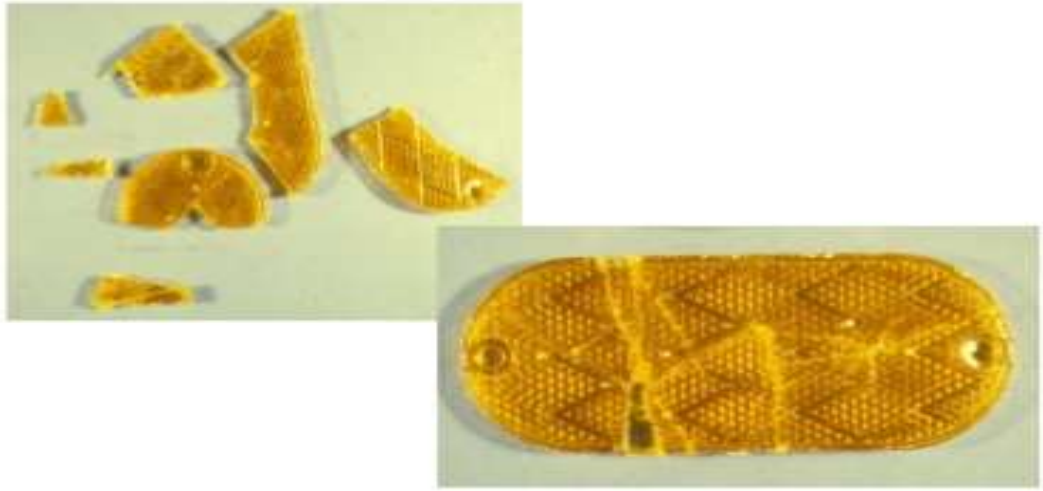
**Did you know?**
**Caliber** (handguns & rifles) or **gauge** (shotguns) refers to the size of the internal diameter of a gun's barrel.

## Fracture Matches

• When an object broken, torn, or cut, two unique edges are formed, which are referred to as fracture lines.

• These edges can be compared by the naked eye or with microscopes to see if they fit together , which indicates that they may have been part of the same object at one time.

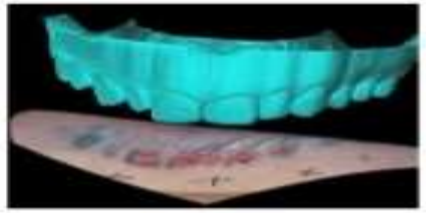
• Investigators may compare the edges on pieces of tape, glass fragments, paint chips, pieces of a car from an accident, paper bag, etc. to find possible matches.



# Impression Evidence

## Shoeprints & Tire Tracks

- Impression evidence can be photographed, lifted with tape, or cast with plaster to compare to a suspect's shoes or tires.
- Investigators will examine the evidence to identify the brand of shoe or tire based on its tread pattern and other physical features to provide leads in the case.
- Shoes and tires will also show wear patterns after being used for a period of time as well as other features (scratches, nicks, and cuts) that can be used to match evidence to specific items. For example, shoeprints can be matched to a suspect based on how the treads on the shoes that are worn down due to that person's walking style.



## Bite Marks

- Each of the 32 teeth in humans is unique due to age and wear.
- Impressions and photographs of bite marks left on a victim, assailant, or other object at a crime scene can often be matched to dental records.

## Tool Marks

- Tiny nicks and chips form on the edges of a tool as it is used, which can be used to identify matches between evidence and suspects.
- Tools may also pick up traces of blood or other substances that can be tested or have fingerprints that can be lifted.

## Body Fluids

• Blood, semen, saliva, sweat, and urine can be analyzed to give investigators information about the crime as well as its victim or the suspect.

• Chemicals and ultra violet light can be used at a crime scene to find body fluid evidence. Areas with potential evidence are swabbed, bagged and collected in vials, which are air tight and have a low risk of cross contamination.

Examples:

► Vomit and urine can be used to test for alcohol, drugs, and poisons.

► Cigarette butts may contain dried saliva.

► Semen containing sperm is valuable for DNA analysis.

► Blood can provide DNA evidence and blood spatter can provide clues about the crime.

## Wounds

• Wounds can often be matched to weapons or tool marks on the weapon. Investigators may also be able to determine the weapon's size, shape, and length.

• Analysis of a wound may provides clues to a victim's injuries, characteristics of the suspect (left-handed, right-handed, height, etc.), and positions of the victim and suspect at the time of the incident.


## Questioned Documents

• Examiners will analyze a ransom note or other document to find clues to link it to a crime scene or a specific suspect. They will analyze the type of paper used, printing method or handwriting style, and type of ink.

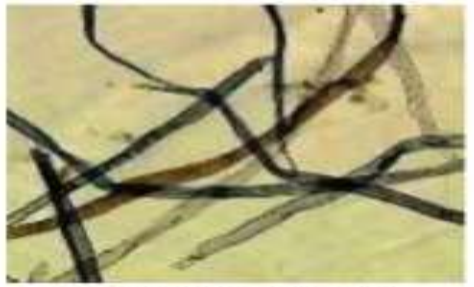
• Other unique features, such as watermarks on stationary or indentations made as someone wrote on a page in a notebook, may provide useful clues.

## Hairs & Fibers

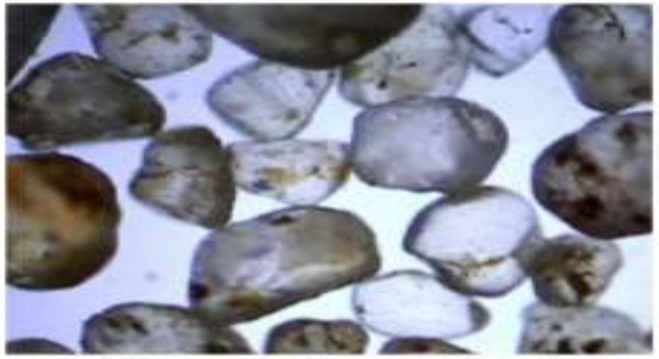
• Hairs and fibers may be transferred from the suspect or the suspect's clothes to the victims' and vice versa. For example, a suspect may pick up carpet fibers on his shoes or leave hairs behind at a crime scene.

• Hairs can be examined to identify their origin, such as human or animal. Hairs with roots intact can be tested for DNA.

• Fibers are used to make clothing, carpeting, furniture, beds, and blankets. They may be natural fibers from plants or animals or synthetic fibers that are man-made.



Microscopic Image of Hairs & Fibers



Microscopic Image of Sand

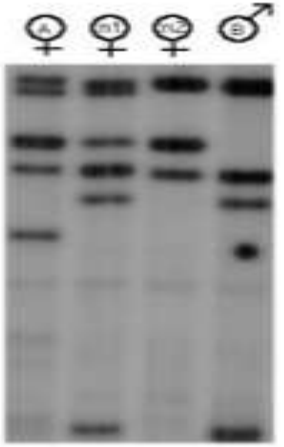
## Dust & Dirt

• Dust, dirt, or sand evidence can reveal where a person has traveled and may be picked up at a crime scene or left behind.

• Investigators examine the samples for chemical composition, pollen, plant material, and other organic matter to find links to a specific crime scene.

Images: http://www.tcamb1.com/images/hairanalysis.jpg and http://www.npsg.uwaterloo.ca/resources/images/microscope/Sand%200004.jpg

## DNA



- Investigators can extract DNA from almost any tissue, including hair, fingernails, bones, teeth and body fluids. The DNA is used to create a profile that can be compared to profiles from suspects or victims.
- CODIS (Combined DNA Index System) is a database maintained by the FBI that is used to find matches to unknown DNA samples from a crime scene.

## Fingerprints

- There are 3 types of fingerprint patterns: arches, loops, and whorls. Investigators also identify unique ridge characteristics in a fingerprint that can be used to identify a suspect or victim.
- AFIS (Automated Fingerprint Identification System) is a database used by investigators at local, state, and national levels to search for matches to fingerprints found at a crime scene.

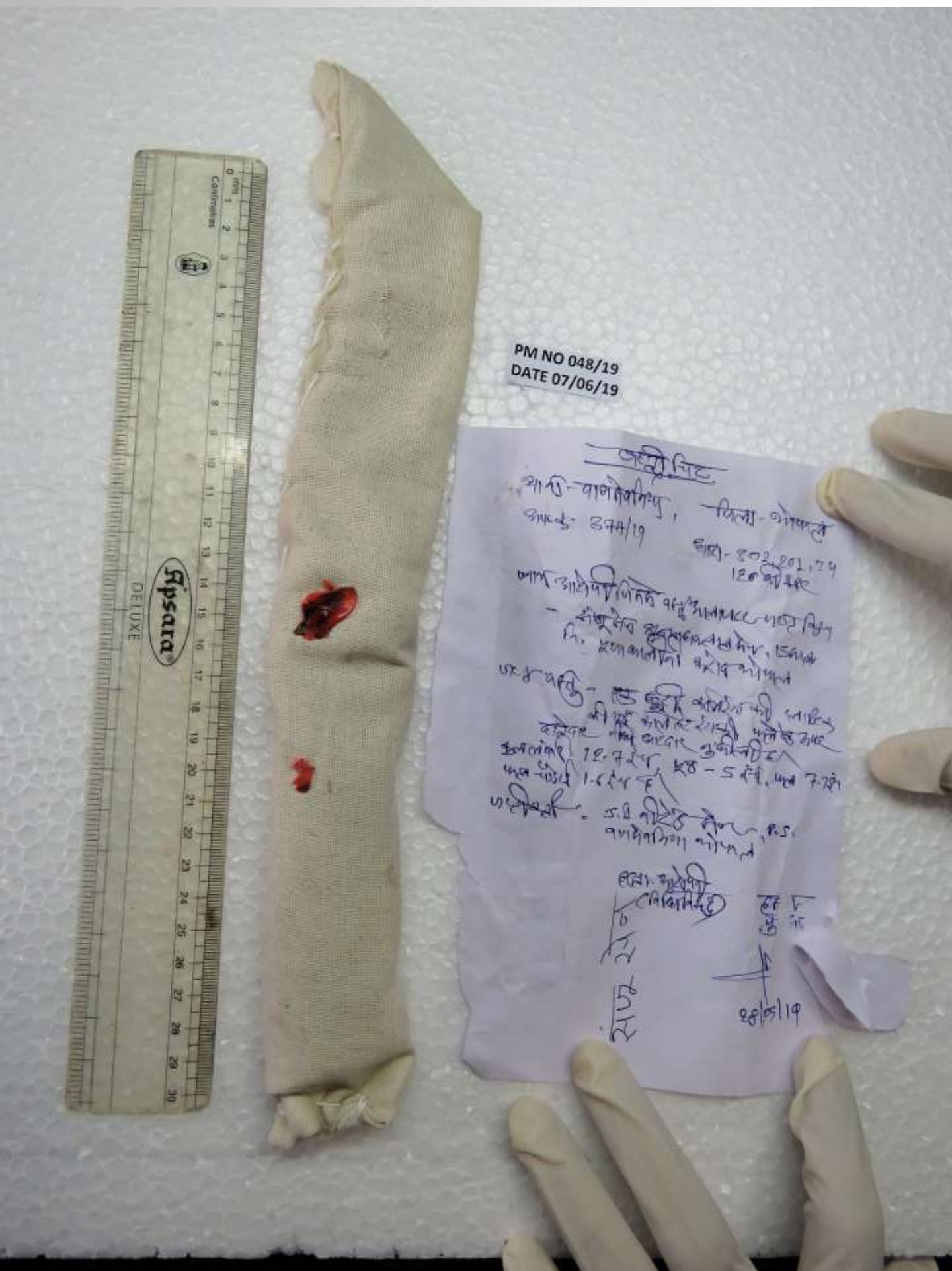
Images: http://biology.arizona.edu/sciconn/lessons2/Vuturo/vuturo/photos/desmus.gif


# Examination of Clothings

- **Identification**
  - Blood
  - Stains-mud, grease etc
  - Semen stains
  - Tears to correlate injury.

# Examination of wounds

# Examination of Weapons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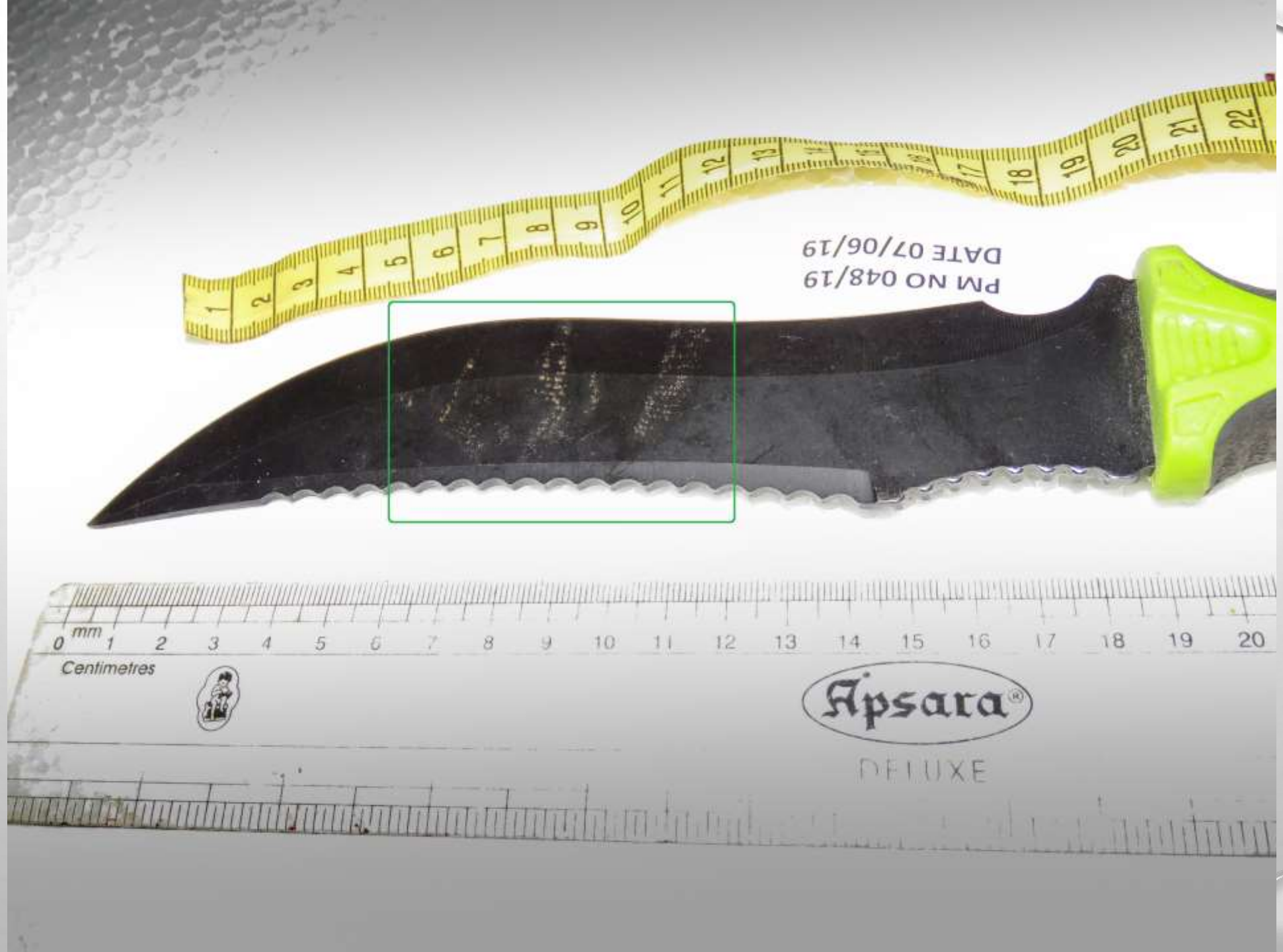
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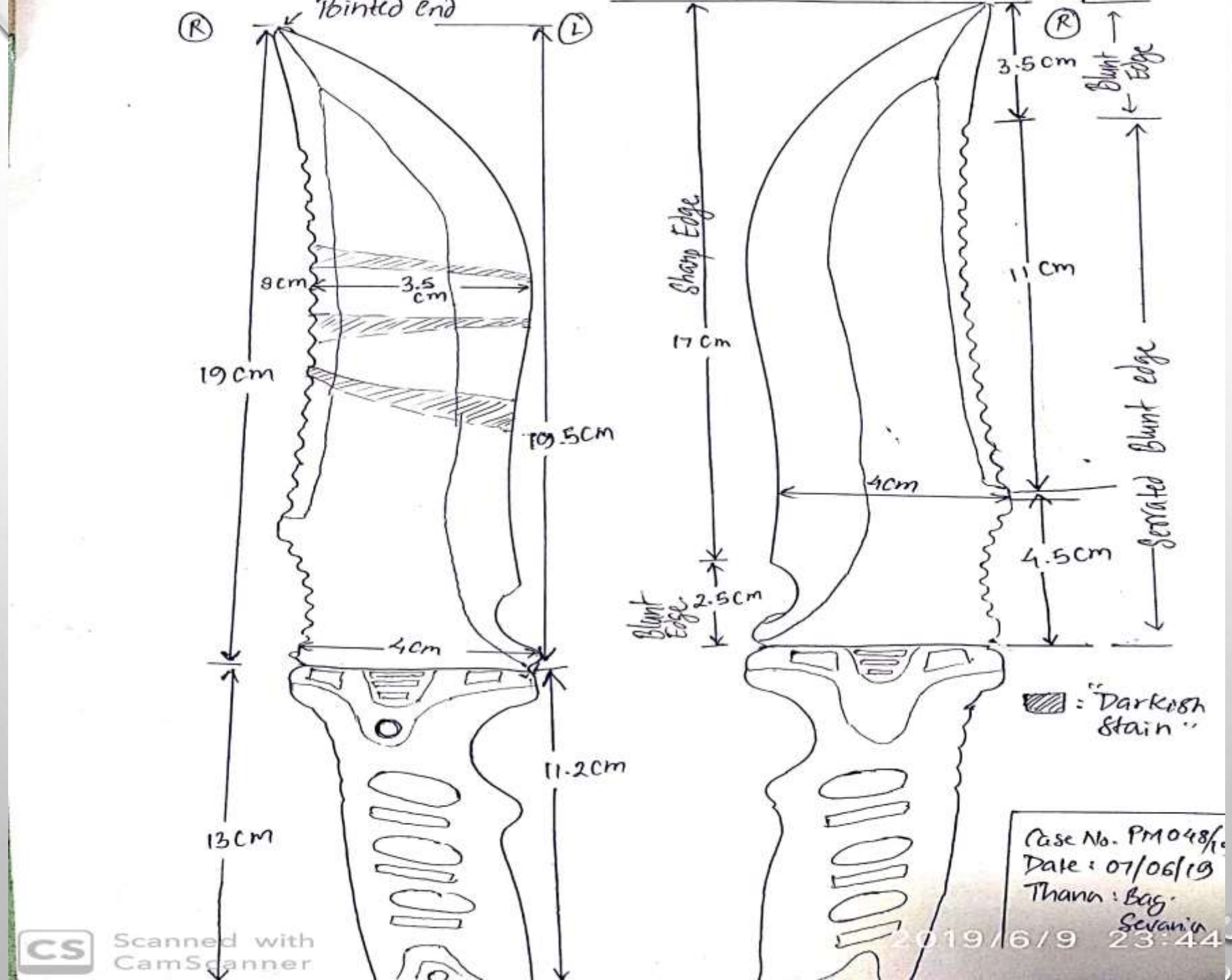
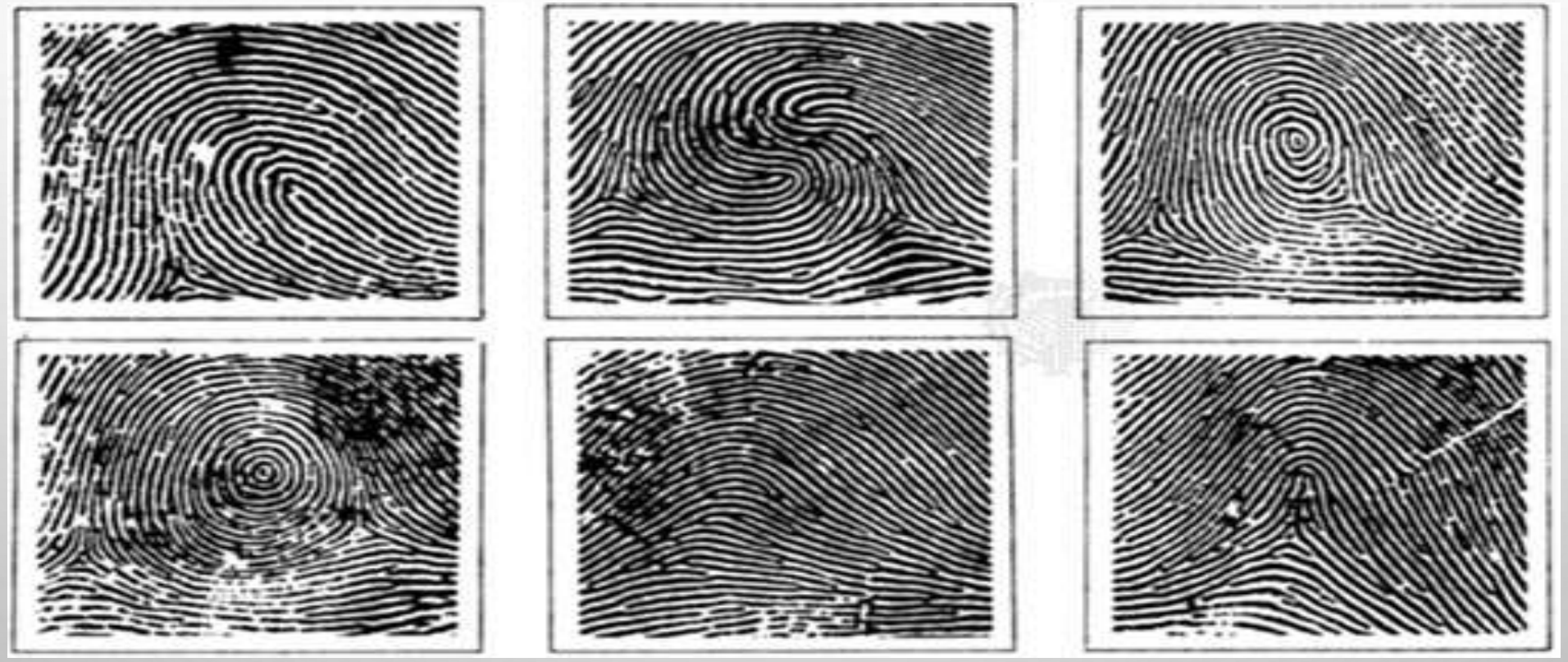
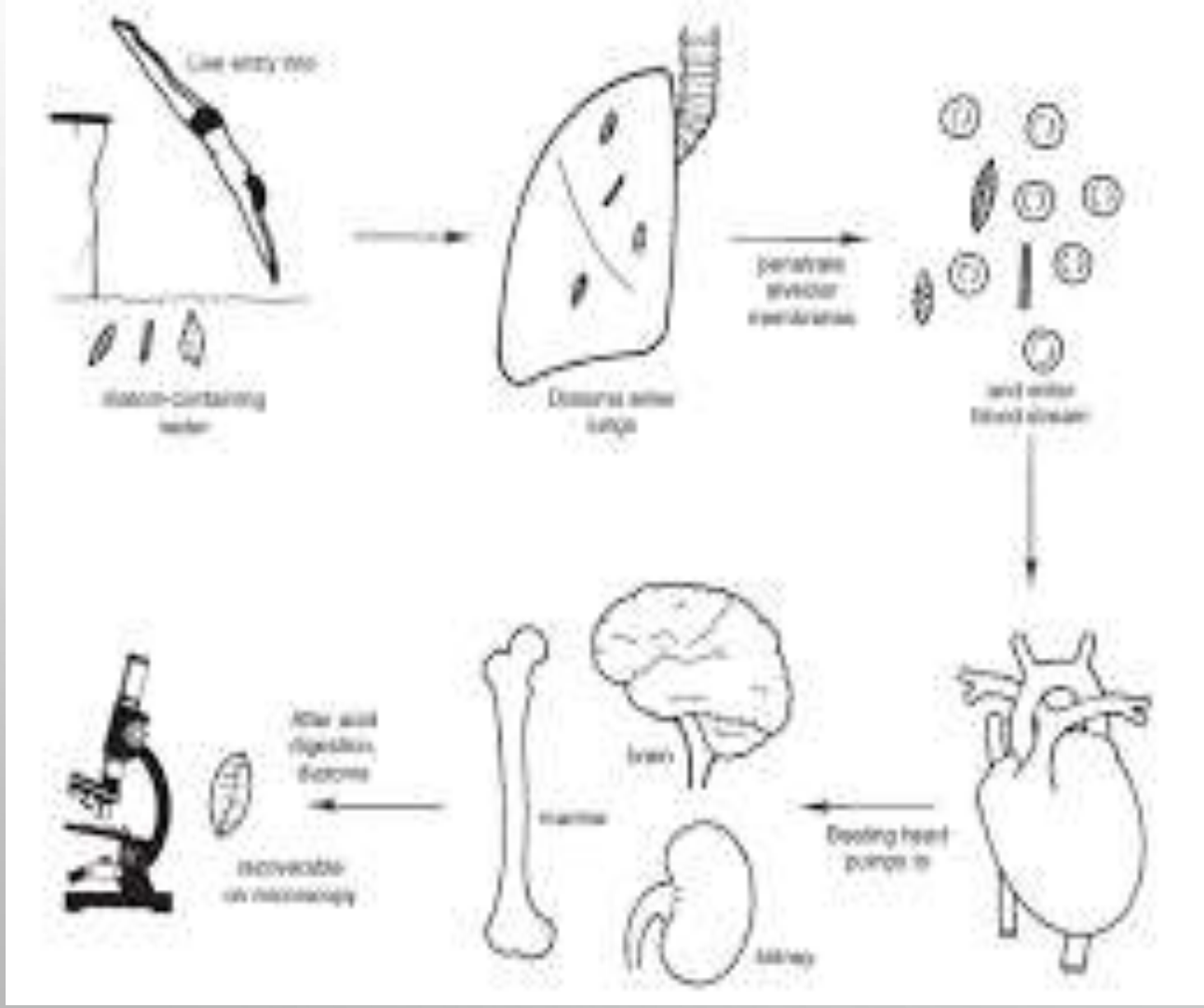


# Finger printing



# Diatoms

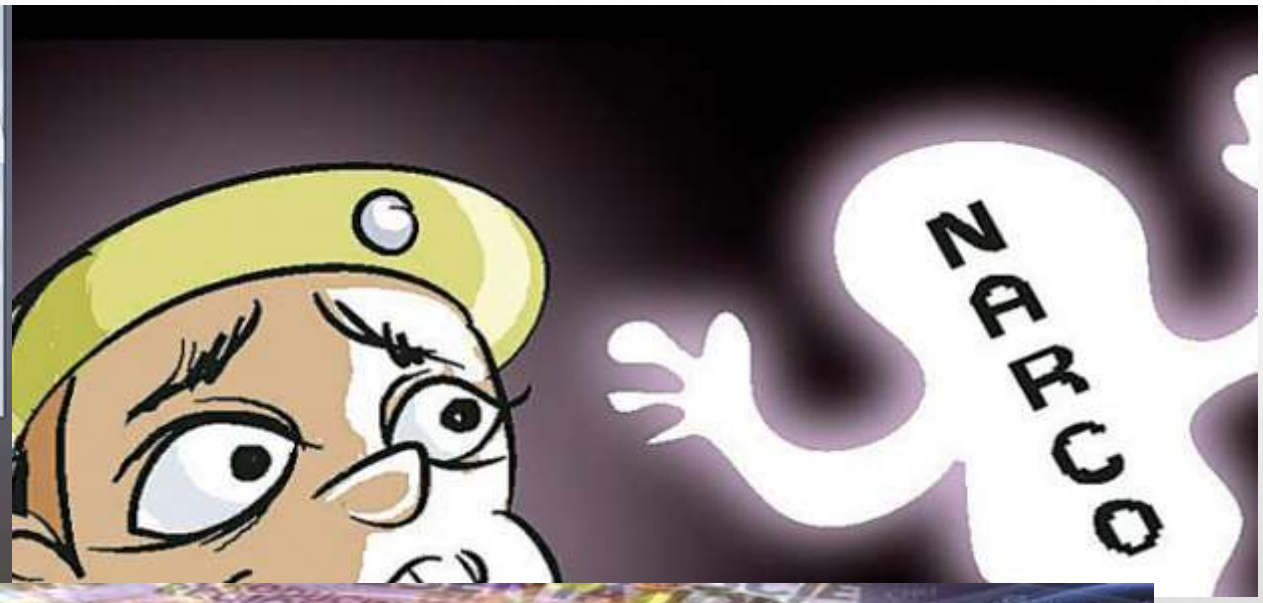



POISON


poisons
medicine
toxiclogy
Read
investigation
Toxicology
analysis
forensic
determining
alcohol
crime
legal
levels
drugs
applications
laboratories
toxicology

**Corroborating evidence** is evidence that tends to support a proposition that is already supported by some initial evidence, therefore confirming the proposition.

# Lie detection tests: Corroborative evidence


# Analyzing Physical Evidence/Scientific Method

There are 3 major avenues available to police investigators for assistance in solving a crime:

1. Confessions by suspects
2. Eyewitness (victims or witnesses)
3. Physical evidence from a crime scene

Out of this only physical evidence is free of inherent error and bias unless spoiled

- A physical evidence starts from crime scene and travels through various hands of scrutiny for its analysis

- **In the last it reaches to the court room**
- It is the place where the **ultimate significance of the evidence is determined**
- Lapses in correctly transferring/interpreting may lead to erroneous charges/convictions/judgements

# Chain of custody

- Relevant evidences need to be collected.

- The sanctity of evidence is to be maintained to make it admissible in court of law

- The process for documenting, collecting, and protecting evidence is called establishing a **chain of custody** to protect it from tampering

- Here a **detailed log** is kept of where the evidence was found and whatever subsequently happened to the evidence prior to trial in the court of law.

अखिल भारतीय आयुर्विज्ञान संस्थान भोपाल
All India Institute of Medical Sciences Bhopal
Forensic Medicine and Toxicology AIIMS Bhopal

| S.No | Date | S.No | PM No. | Name | Age | Sex | Police Station | Cause of Death |
|---|---|---|---|---|---|---|---|---|
| 19 | 17/05/18 | 19 | 021/18 | Ayan Prakash S/o Rama Nand Mishra | 19 | M | Bagh Sevaniya Dist Bhopal | multiple ante mortem injuries and its consequences |
| | Note | | | 21/5/18 - : . — — (Received query & reply for ante mortem injuries) | | | | |
| 20 | 19/05/18 | 20 | 022/18 | Rajendra Shakya S/o Nanhulal | 20 | M | Awadhpuri Dist Bhopal | due to ante mortem hanging |
| 21 | 21/05/18 | 21 | 023/18 | Seema Wankhede D/o Wankhede Pandit | 39 | F | Bagh Sevaniya Dist Bhopal | due to ante mortem hanging |
| 22 | 22/05/18 | 22 | 022/18 | Mohar Singh meena S/o Kishan meena | 40 | M | Katara Hills Dist Bhopal | due to ante mortem Hanging |
| 23 | 24/05/18 | 23 | 023/18 | Unknown body | | M | Bagh Sevaniya Dist Bhopal | multiple ante mortem injury |
| 24 | 06/05/18 | 24 | 024/18 | Bholaram prajapati S/o Nathuram Prajapati | 49 | M | Bagh Sevaniya Dist Bhopal | death is multiple ante mortem injuries and its complications. |



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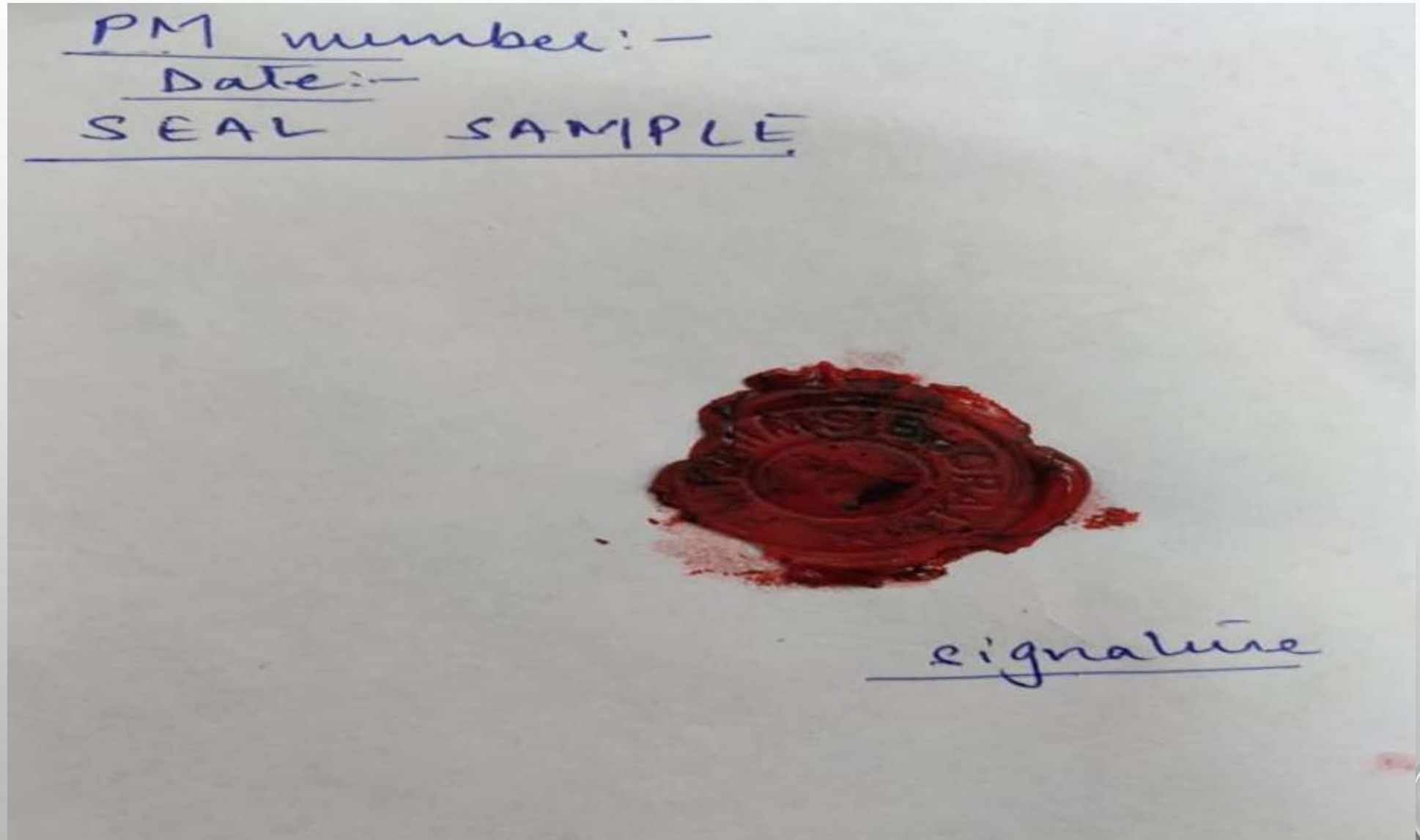
All India Institute of Medical Sciences Bhopal
Forensic Medicine and Toxicology AIIMS Bhopal

| Manner of Death | Article Preserved | Autopsy Surgeon | Report Received (Signature) |
|---|---|---|---|
| Accident | Nil | Dr Raghvendra Vidua<br>Dr mangi yadav | 7587601604 |
| Suicidal | Ligature material<br>3 strands of hairs | Dr Raghvendra Vidua<br>Dr Chinmay<br>R Kamat | 7/5/18<br>C/02 Manoj Singh<br>PS Awadhpuri<br>7718547206 |
| Suicidal | Ligature material<br>1 Photo - 7<br>Vaginal smear | Dr Raghvendra Vidua<br>Dr Rajesh Rulia | ASI Ramdas Sahi<br>7049104570 |
| Suicidal | Viscera (A) Ligature material @ 260/- and (B) Folding knife<br>No. of photos = 13 | Dr Brinda Patel<br>Dr Brinda | Sinku Singh<br>PS- Kotwali Mob<br>PS 8762732357 |
| Accidental | Viscera (A) Piece of Liver lung (B) Piece of Heart (C) muscle tissue (D) mandible bone with teeth)<br>(a) Blue Top Vial (b) White Top Vial c) One Tavia.<br>(E) Seal of sample<br>(F) Sample of preservation solution | Dr Raghvendra Kushwa<br>Dr priyanka | |
| Accidental | Nil<br>Duplicate Sent PM, Final PM, Panchnama, Hospital Records Issued | Dr Ramesh<br>Dr Rajesh Kirar | Dhanraj Singh Dhakad<br>Ambikal<br>7587601604 |

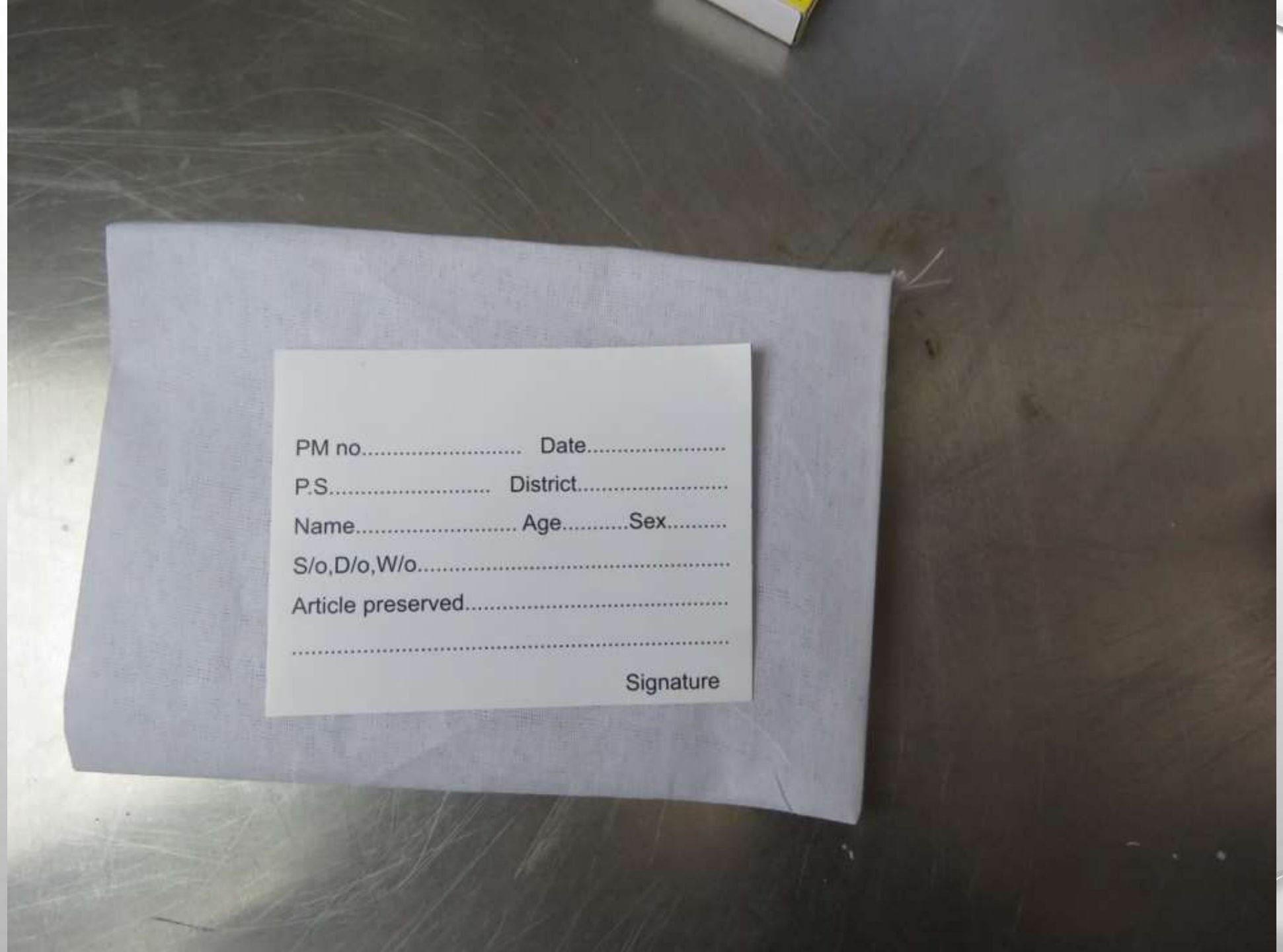
# Method of Preserving an evidence

- Physical evidence is collected in appropriate waterproof and airtight container and taped
- A seal on **melted lac** material is put over the sealing tap covering the terminal ends
- Label with the details is pasted
- Handed over to the Investigating officer concerned along with the sample of seal

# Sample of seal




AIM
SAFETY MATCHES
AIM
BHOPAL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Article preserved.....
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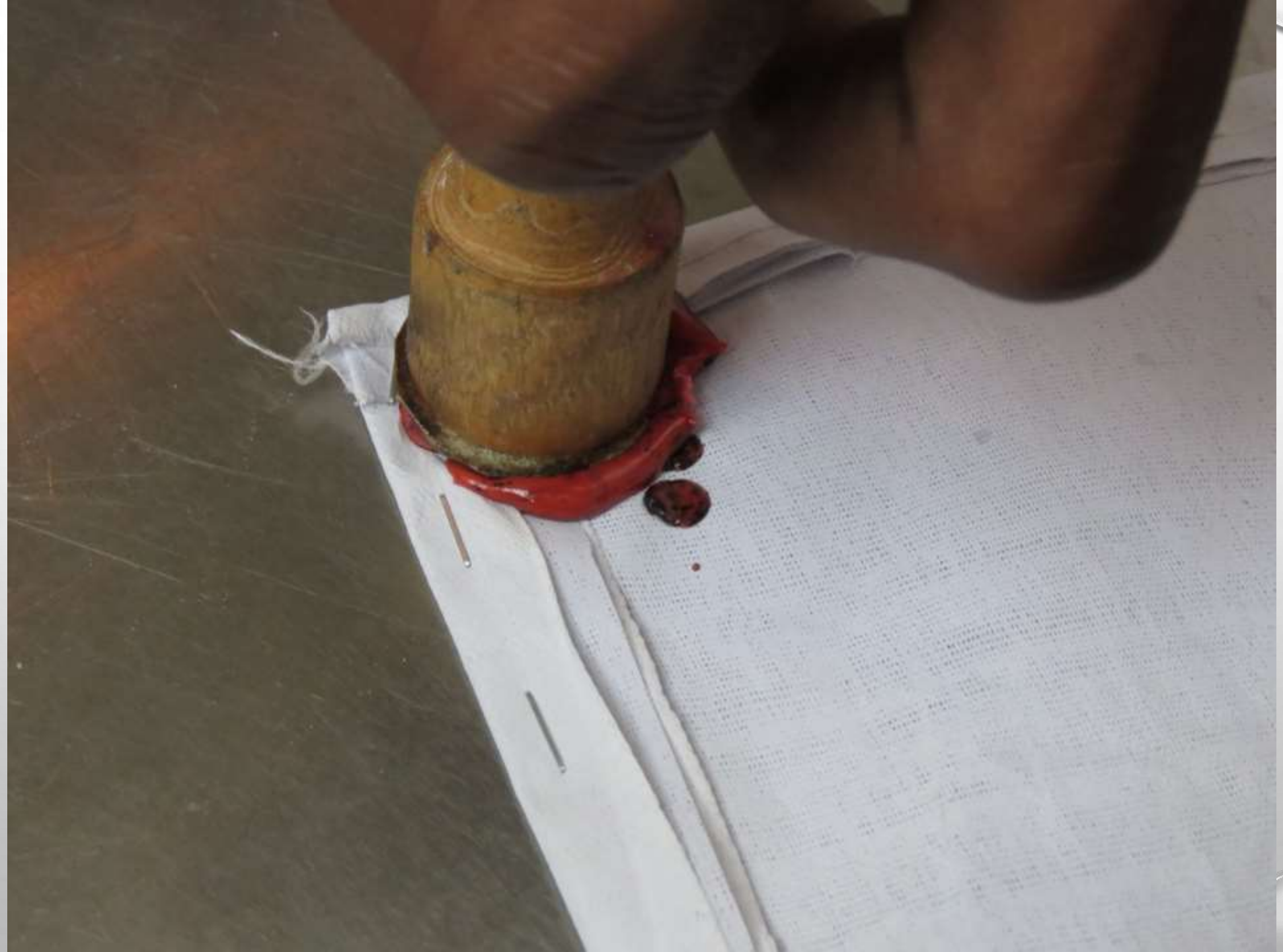
Signature



# Intact and legible


10 %

# Three basic steps in analysis-

1. Observe the material
2. Determine identity
3. Find out the origin

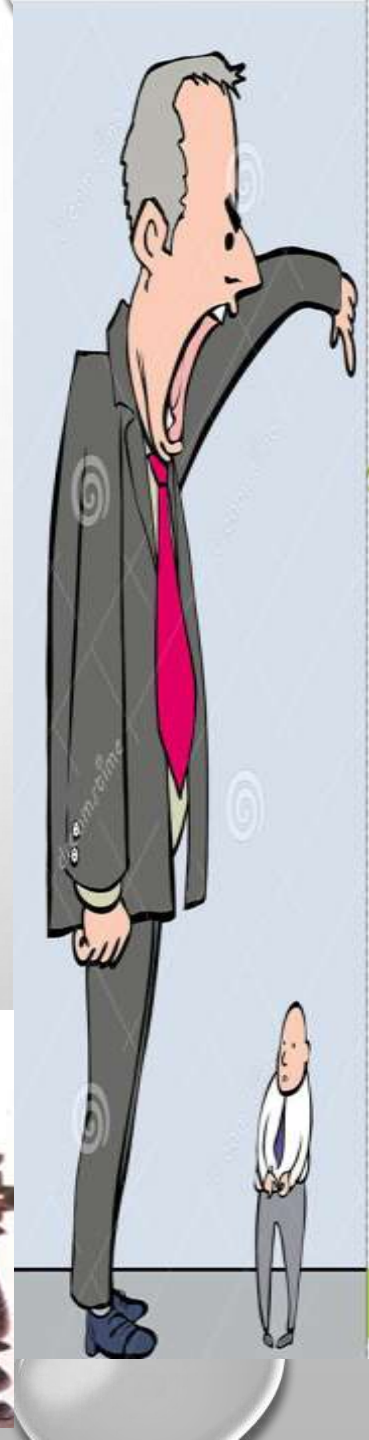
# Testing Physical Evidence

- Questioned sample (Q)
  - Material collected from known location but of unknown origin
- Known sample (K)
  - Material that comes from a proven or known source
- Control Sample
  - Material that is similar to the questioned sample and known samples and is used to validate the test method and procedure
  - It is expected to respond in a certain way in testing
  - Used to validate method of testing by comparing test results to those of the questioned and known sample
- Questioned sample is compared to a known sample

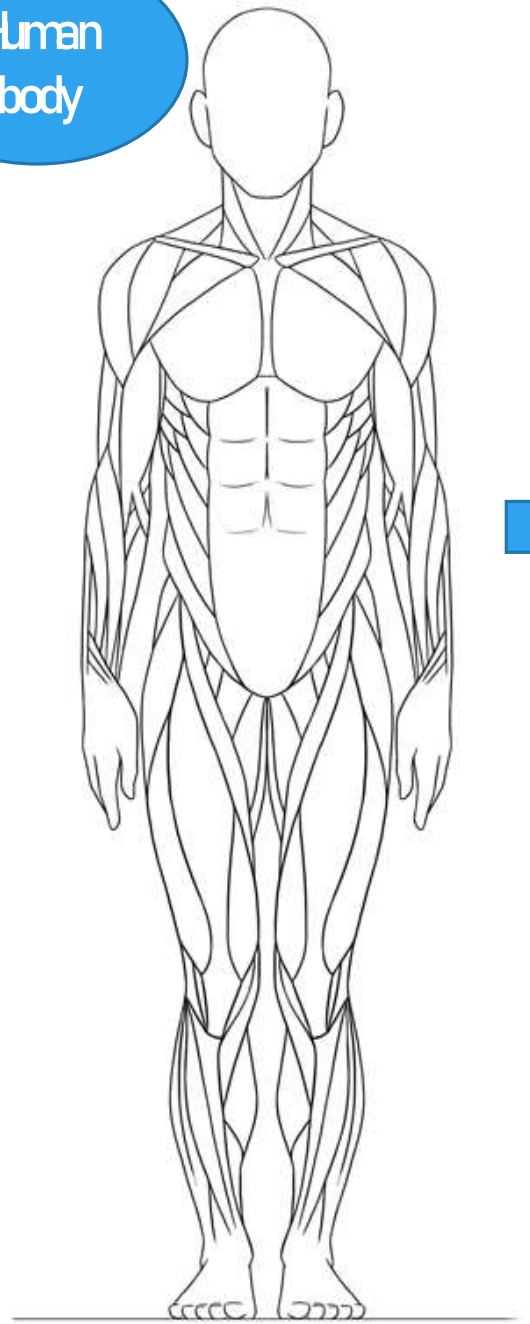
# How was he identified after death??

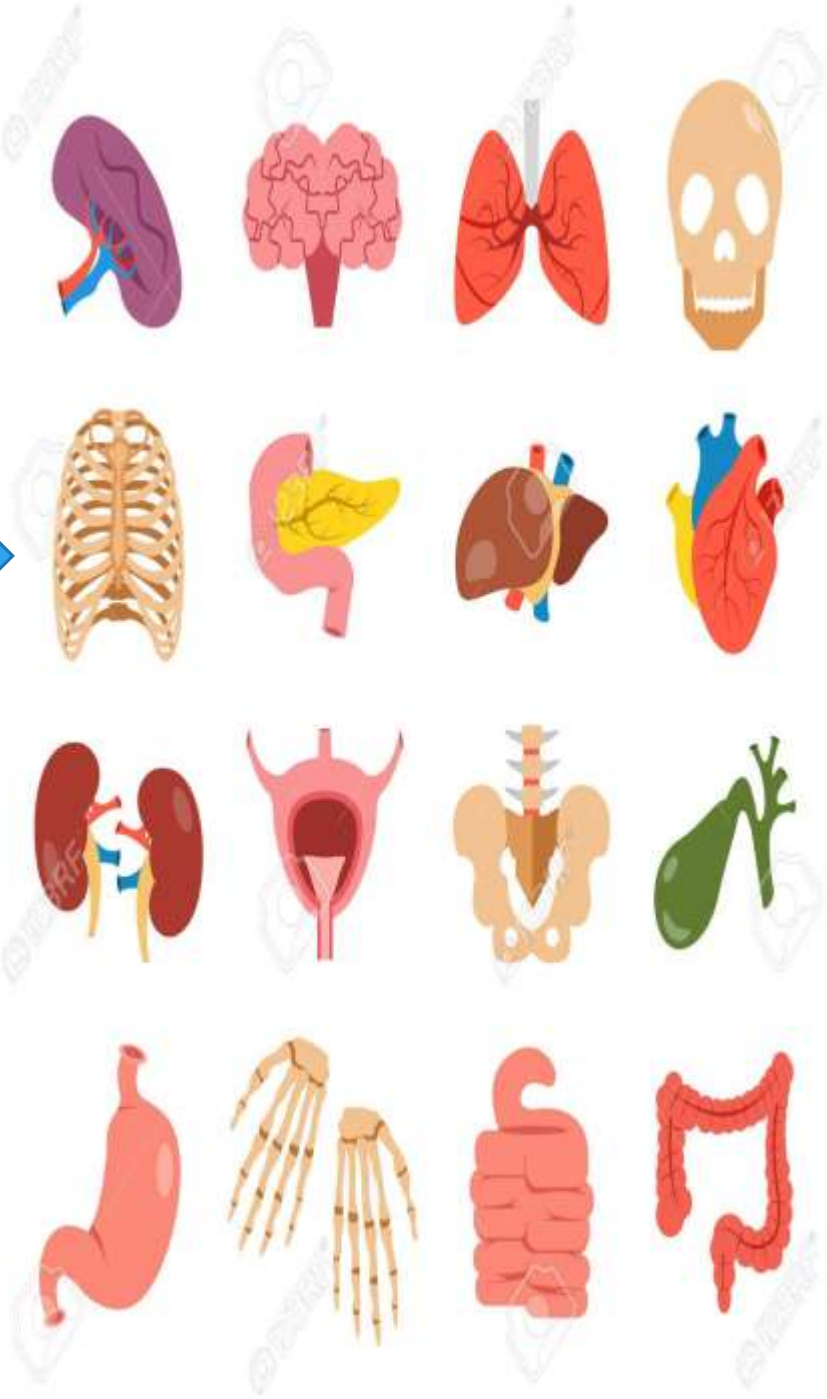
- **Abu Bakr al-Baghdadi:** his underwear was 'stolen' for DNA test
- Control sample developed
- Questioned sample taken from the scene
- Comparison tests were carried out on site by technicians who accompanied the special forces personnel and had samples of Baghdadi's DNA with them.
- They combined facial recognition and a smaller DNA reader technology to confirm the identity

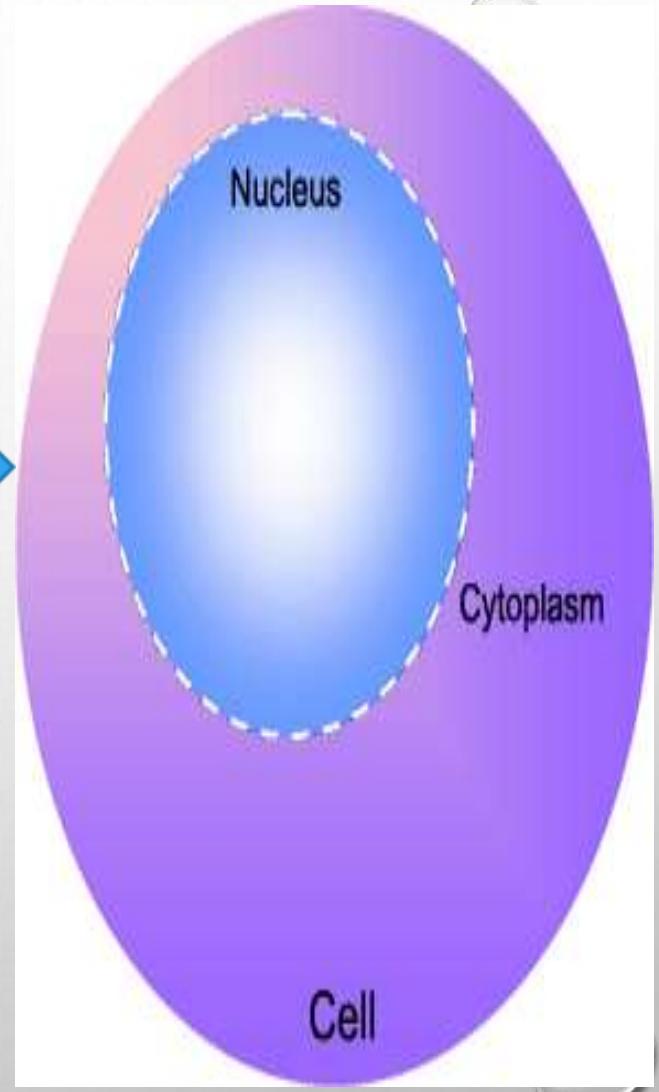
The principles of the scientific method provide a safety net to ensure the outcome of an investigation is not tainted by human emotion or compromised by belittling, distorting, or ignoring contrary evidence



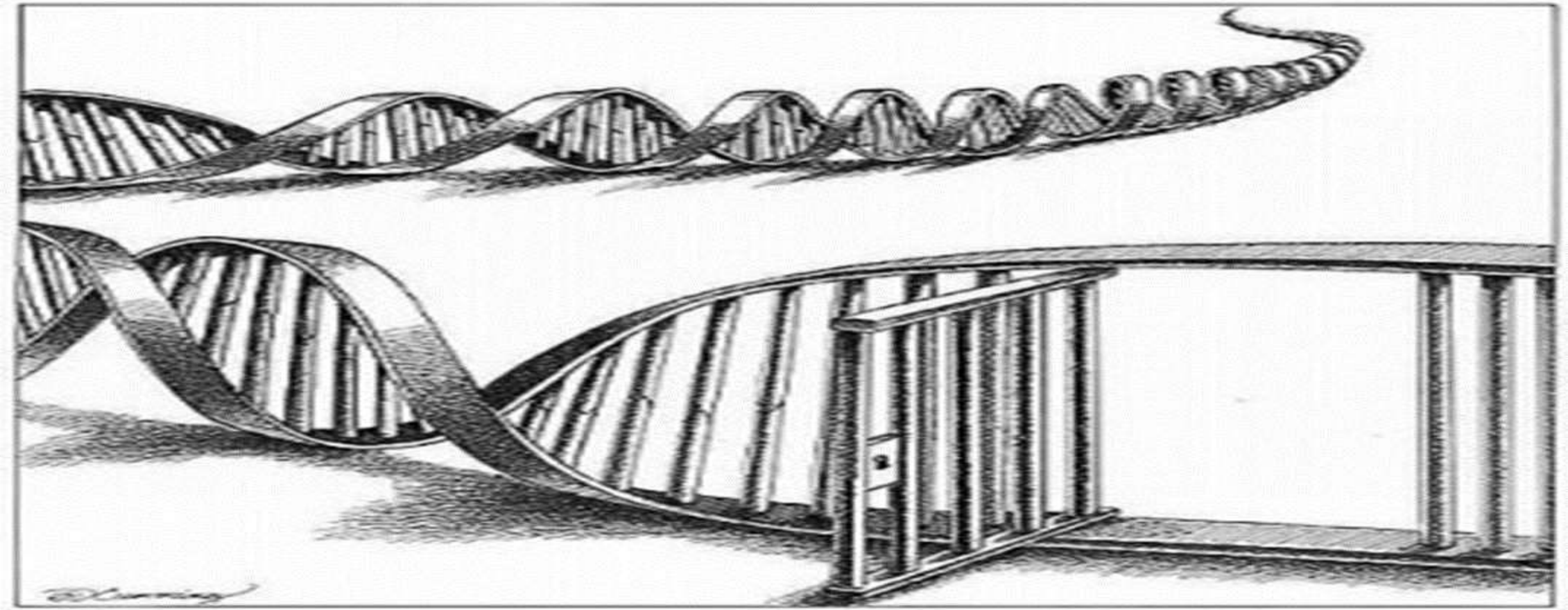
Human body







# DNA Profiling



- DNA testing was initially introduced into criminal justice systems as a method of developing **supplemental evidence** to be used in convicting violent felony offenders or freeing the innocent

- **Most people are unlikely to commit serious crimes like** "homicide and sexual assault because DNA evidence is more likely to be uncovered in homicides and sexual attacks than in other crimes."

**The DNA collection by law enforcement is now routinely being used for a multiplicity of purposes that pose significant privacy and civil rights concerns to every citizen.**

A growing trend towards the permanent retention of DNA from innocent people in forensic DNA databanks.

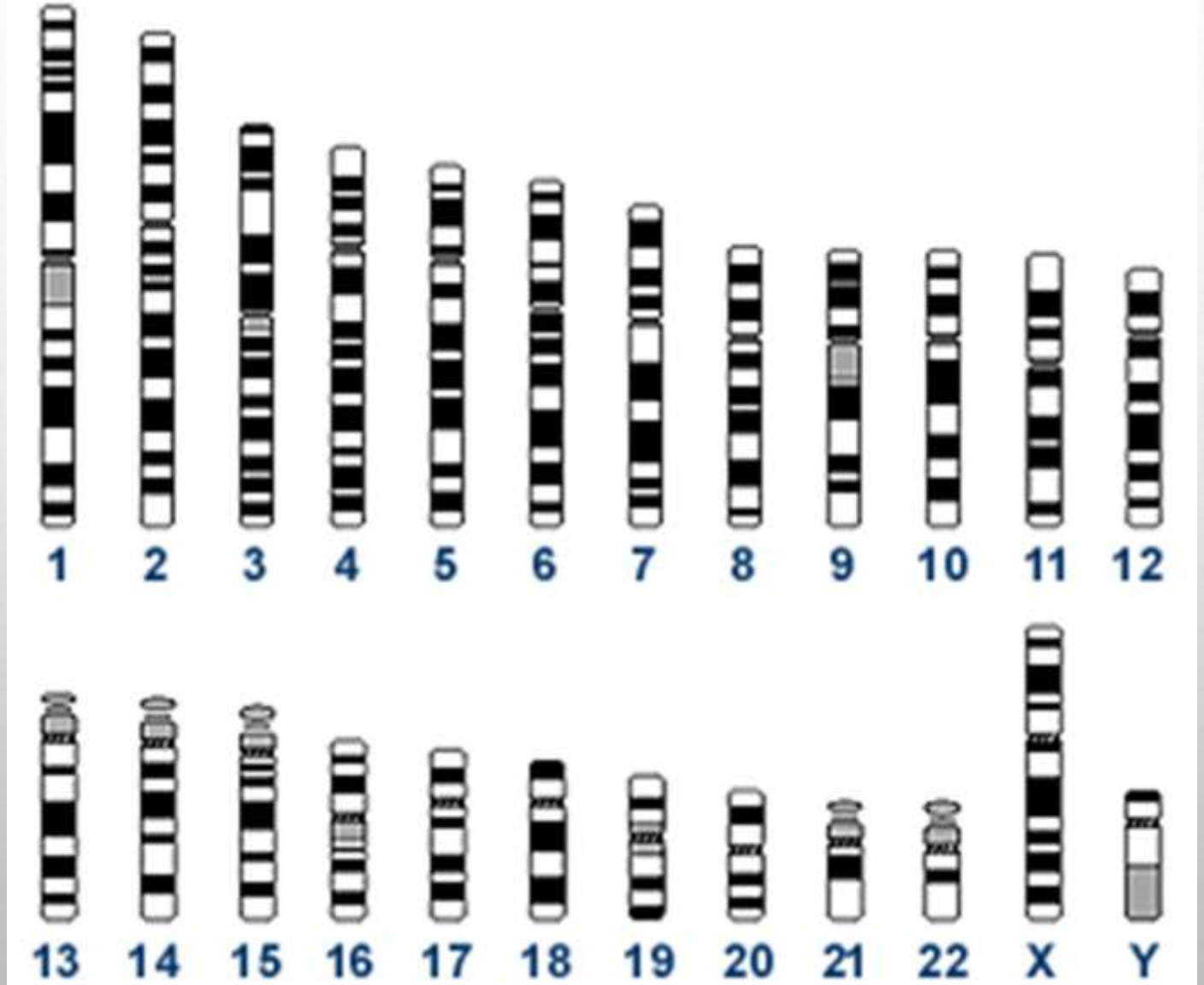
Collecting and searching DNA left behind on items such as cigarette butts and coffee cups.

The creation of local “offline” forensic DNA databases.

# What do Police Do When They Take Your DNA

- Biological Sample
- From the Sample Lab Techs Can Extract DNA
- There are Standard Sites on Multiple Chromosomes which are used to obtain a “profile” of the person from their DNA
- There are multiple sites located on several of our 23 chromosomes; each site is called a locus
- Then the DNA profile from crime scene is compared with a suspect

# STR Loci with Chromosomal Positions-Hypervariable Sites



# What our DNA Can Reveal?

**DNA is far different from other methods of identification such as fingerprints. It is a window into an individual's medical history as well as that of his or her entire family.**

- disease states (inherited genetic parental linkages—who your parents are or aren't
- predispositional states (mutations that correlate with the onset of a disease)
- parental linkages—who your parents are or aren't
- ancestral identity-Haplotype groups
- sibling connections
- familial disease patterns
- environmental and drug sensitivities
- locational presence (DNA left at a site).

# CRIME SCENE SAMPLES FOR DNA

- Clothings, pillows, bed sheets- blood, semen, saliva, hair
- Bullet- blood
- Cigarette butt- saliva
- Used Condoms- semen, vaginal secretions
- Envelope-saliva
- Fetal and maternal tissue
- Urine
- Sweat
- Nasal secretions
- Faecal stains
- Vomitus
- Tissue ( bone marrow, muscle, spleen, fingernail scrapings)
- Mouth swabs

# COLLECTION OF SAMPLES COMMONLY USED FOR DNA IN FORENSIC PRACTICE

- **Liquid blood:** 2-5 ml of iv drawn blood in sterile, leak-proof, screw capped bottles containing heparin or EDTA along with an identification card.

- **Semen samples:** sterile cotton ear buds moistened with sterile water should be used to take swabs (from genital and other body parts) completely air dried, placed in sterile tubes, sealed and labelled.

- **Stains from crime scenes:** stains should be swabbed with cotton buds moistened with sterile water.

- **Blood/semen from individuals under field conditions:** can be collected in a sterile tube and same should be spread on a sterile bandage cloth folded several times so as to absorb all the fluid, air dried, placed in a clean envelope, sealed labelled and sent to DNA lab at room temperature.

- **Bones:** long and intact bones, e.g. femur /humerus are most suitable.

- **Visceral samples:** Muscle is the most ideal source. Approx 100 gms in wt should be dissected out and placed in sterile glass tube containing normal saline as preservative. (Dimethyl sulphoxide/DMSO is a better preservative)

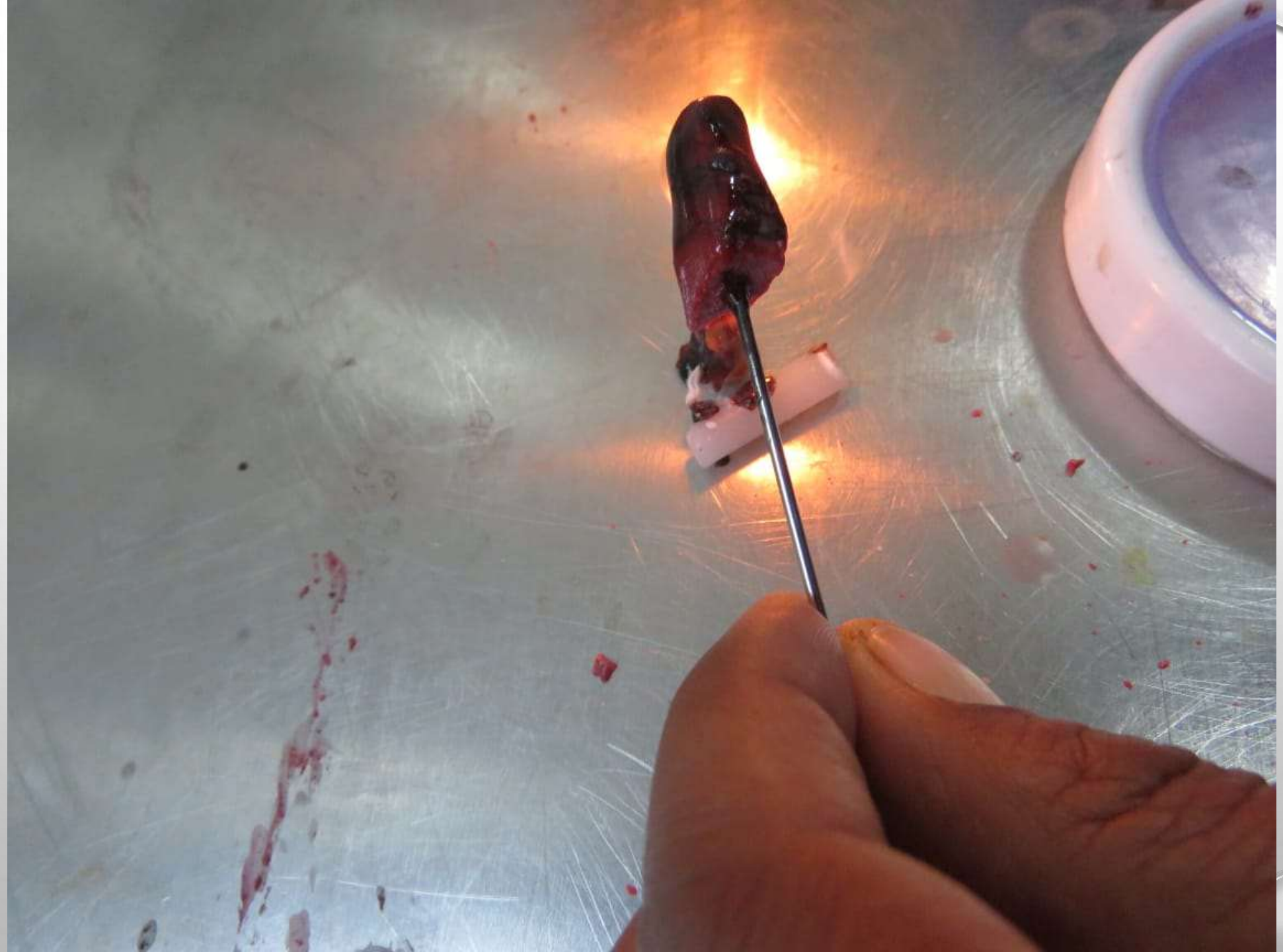
- **In exhumation cases:** if dry tissue is present, should be placed in sterile bottle without preservative and sent to lab at room temperature.
- **Teeth:** molar teeth are generally used. If not available, any other teeth may be used. For teeth and bones no preservative is required.
- **Hair:** preferably with roots, to be packed in clean paper, sealed and sent at room temperature.
- **Finger nail scrapings:** sterile needle or tooth pick to be used to scrape the inside of finger nails. Material should be collected in clean paper envelopes and sent to lab without preservatives.

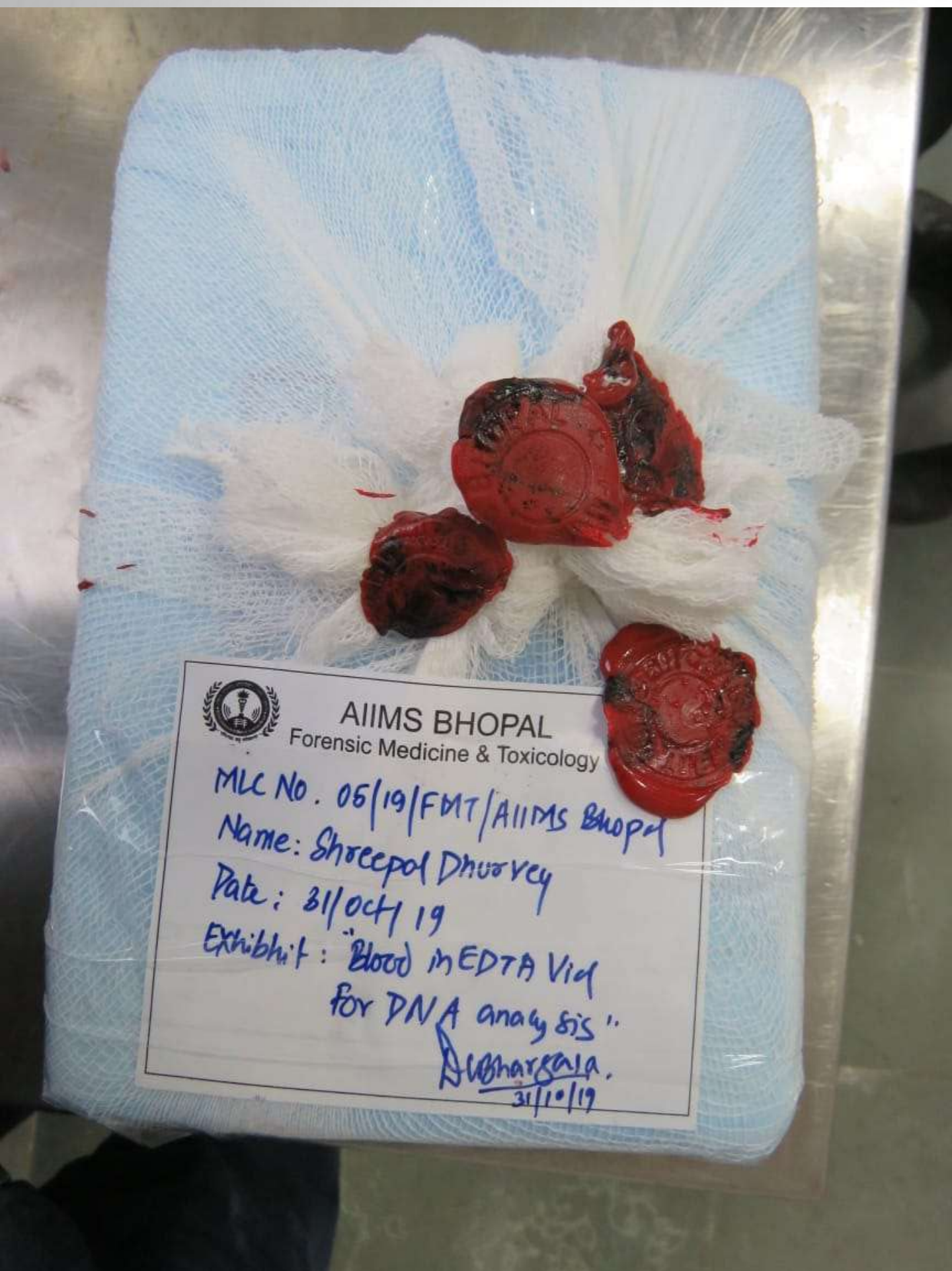

COLLECTED BY
DATE : 31/10/19
TIME : 4:30pm


APPE
TNER IN DIAGNOSTICS
REUSE OR

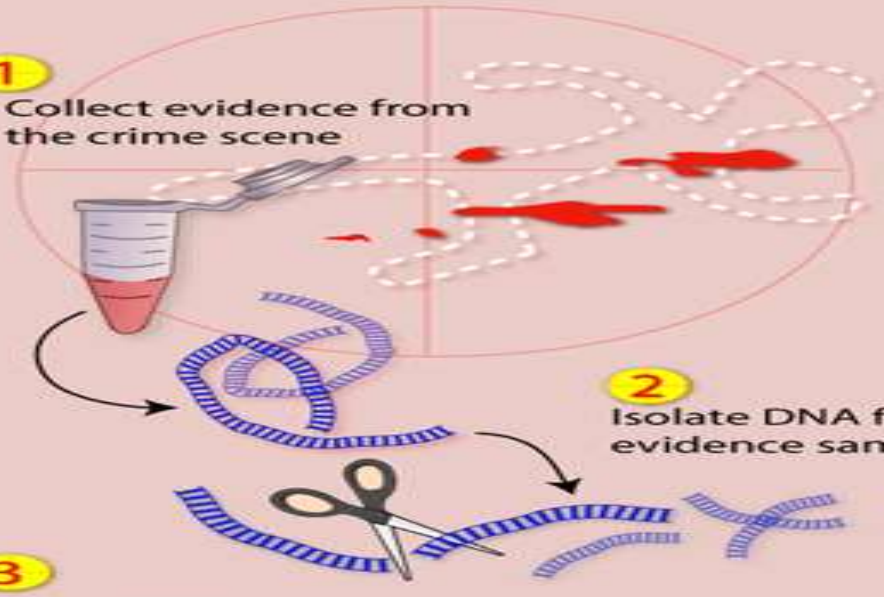

DONATE BLOOD, SAVE A LIFE
कृपया आप रक्त दान जरूर करें।
PLEASE CRUSH BOX AFTER USE


Latex
Surgical Gloves
STERILE




AIIMS BHOPAL
Forensic Medicine & Toxicology
MLC No. 05/19/FMT/AIIMS Bhopal
Name: Shreepal Dhurvey
Date: 31/Oct/19
Exhibit: "Blood in EDTA Vial
for DNA analysis".
Dr Bhargava.
31/10/19

1 Collect evidence from the crime scene



2 Isolate DNA from an evidence sample

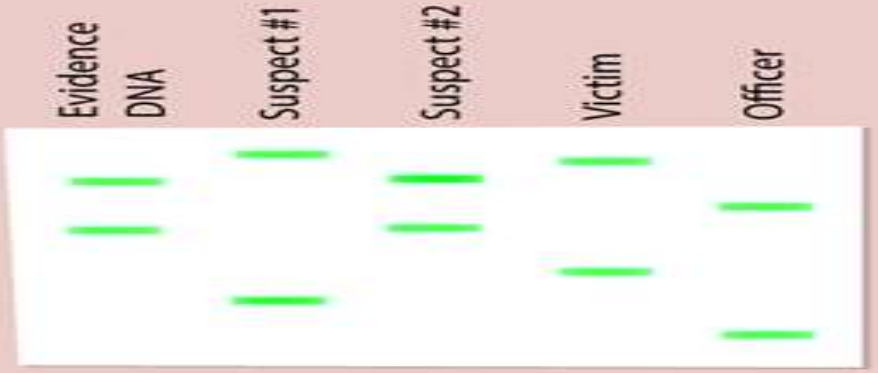
3 Cut the DNA into fragments using specialized protein "scissors" called restriction enzymes. For every person, the sizes of the cut fragments are unique - except for identical twins.

4 Separate the negatively charged DNA fragments in a gel by passing an electric current through it.


5 Transfer the DNA fragments from the gel to a sheet of membrane

6 Probe the membrane with DNA fragments that complement the DNA sequence of the fragments of interest.

7 Compare the fragment profile of the evidence DNA with those of the suspects, detective and victim to see if they match.

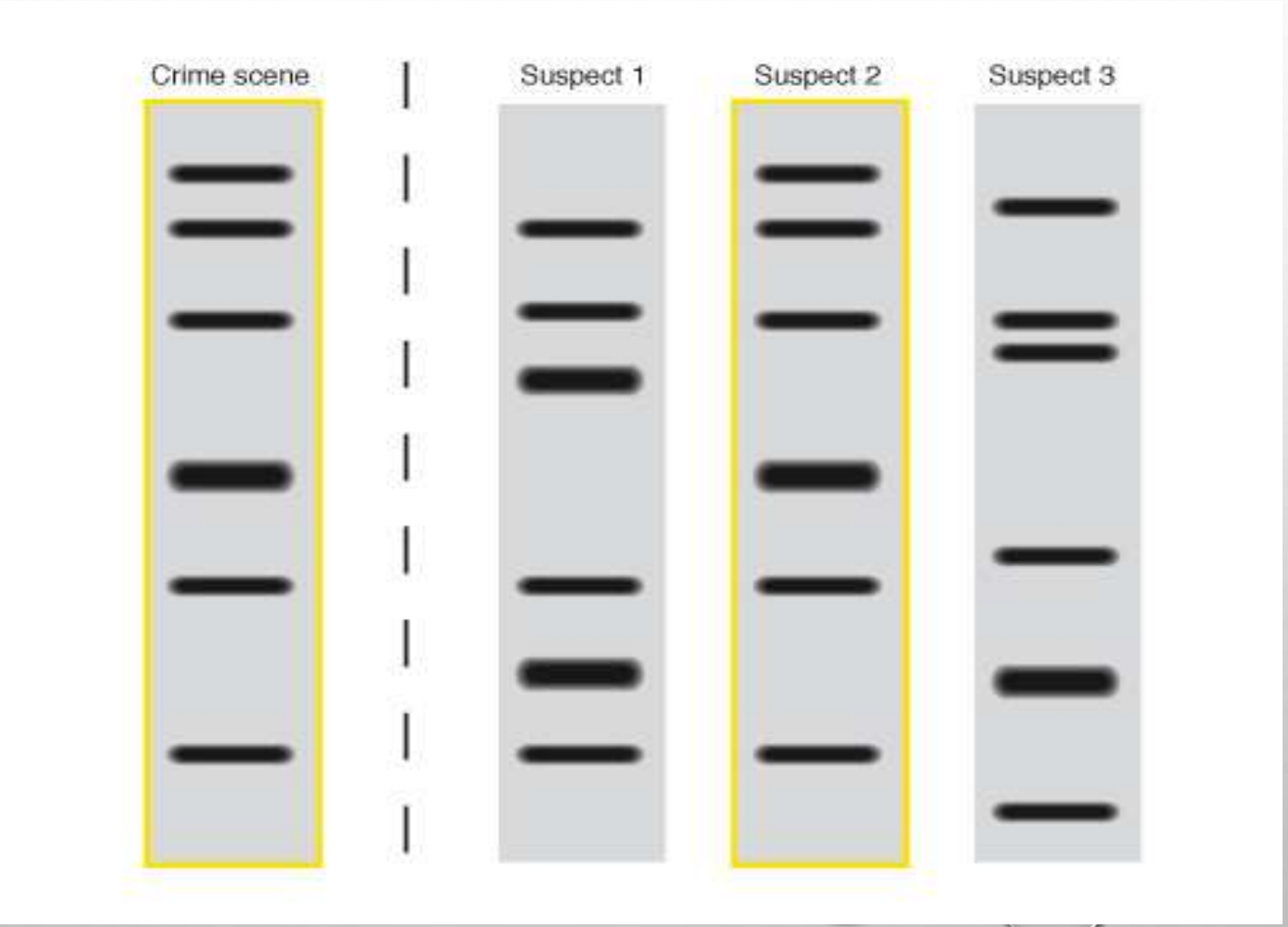



8 Re-probe the membrane up to 10 more times to identify different fragments.

If the profiles from the evidence DNA and a suspect match multiple times,then it is very likely that the evidence DNA came from the suspect.

# Comparison of DNA samples from crime scene to that of different suspects

**DNA sample from the crime scene**



# Benefit of DNA as an evidence

- Reliable
- Scientific
- Unbiased

**A man can lie but science doesn't unless manipulated**

- **S.191 IPC giving false evidence**
- **S.192 IPC fabricating false evidence**
- **S.193 IPC punishment for false evidence**
- **S.194 IPC fabricating false evidence**
- **S.201 IPC disappearance of evidence**
- **S.204 IPC-destruction of evidence**

# Interpreting Results of DNA Analysis in Criminal Investigation

- 1) **Inclusion:** When the DNA profile of a known individual (A victim or suspect) **matches** the DNA profile from the crime scene evidence, the individual is "included" as a potential source of that evidence.

- 2) **Exclusion:** When the DNA profile from an individual (A victim or suspect) **does not match** the DNA profile generated from the crime scene evidence, the referenced individual is "excluded" as the donor of the evidence.

- 3) **Inconclusive:** Inconclusive results indicate that DNA testing **did not produce information** that would allow an individual to be either included or excluded as the source of the biological evidence.

# Touch DNA

- **Touch DNA** is a forensic method for analysing DNA left at the scene of a crime.
- It is called **"touch DNA"** because it only requires very small samples, for example from skin cells left on an object after it has been touched or casually handled.
- It only requires seven or eight cells from the outermost layer of our skin.

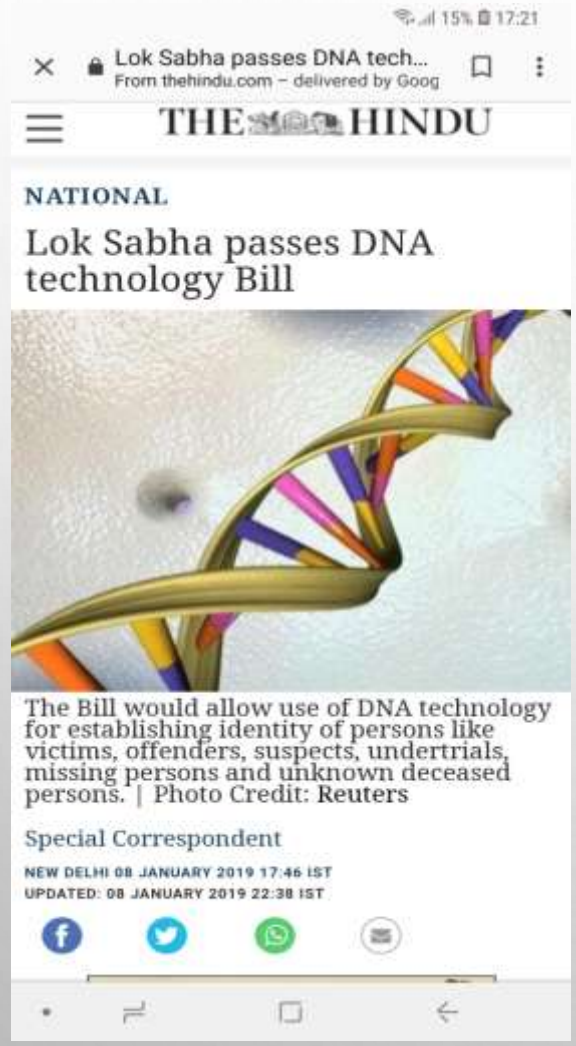
# DNA AS AN EVIDENCE

- It is admissible as evidence under IEA
- Presence of an individual's DNA on an item does not prove their guilt.
- Conversely, a lack of DNA does not necessarily prove their innocence.

# ISSUES and LIMITATIONS of DNA profiling

- Tests unreliable if quantity is less or the sample is degraded.
- Cost effectiveness.
- Lack of qualified experts.
- It may give incorrect results due to errors like cross contamination

# DNA BILL PASSED In INDIA





**“DNA Profiling makes it possible to determine whether the source of origin of one body substance is identical to that of another, and further to establish the biological relationship, if any, between two individuals, living or dead *without any doubt*.”…….means with 100% surety**

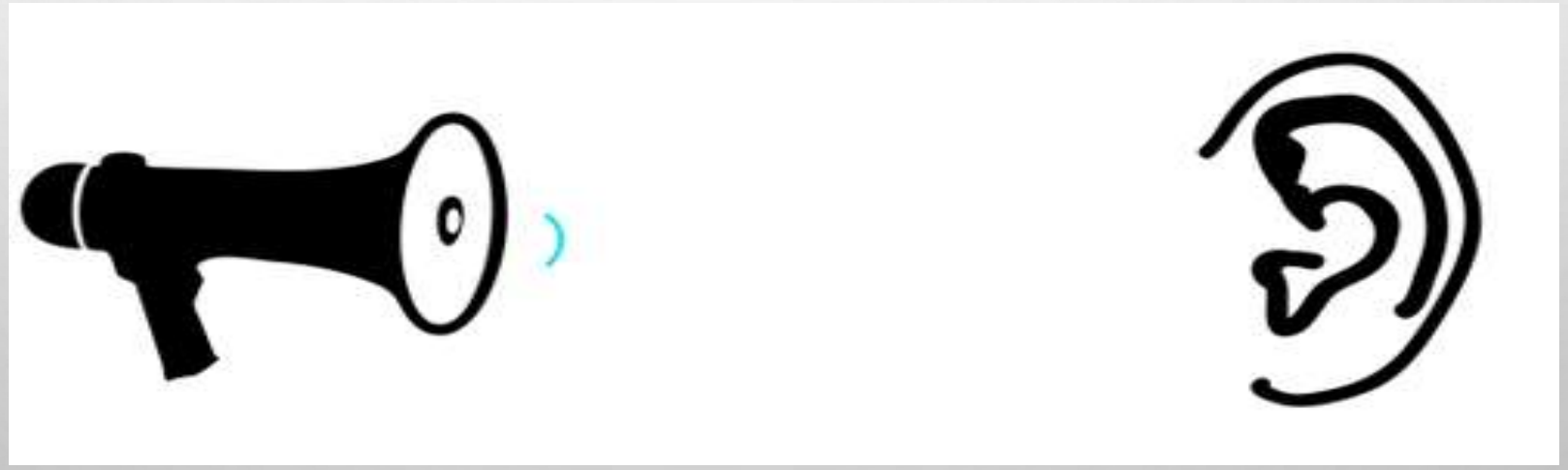
**(ignores false matches, cross-contamination, laboratory error etc)**

# With New Technologies Come New Powers

**Technology can be used justly and democratically or it can be used unjustly or undemocratically**

**Preserving the balance between the legitimate needs of law enforcement and the security of citizens with human rights**

**DEAD MEN TELL TALES .....**
**YOU NEED AN EAR TO HEAR THEM!**



# Reasons for reluctance of courts to use Forensic evidence

1. **Mismanagement of Forensic evidence**

- Ignorance
- Improper collection
- Improper preservation
- Delayed collection
- Non collection of clue evidence
- Non maintenance of chain of custody
- Delayed dispatch for analysis

## 2. Not sending the accused for Medico-legal examination

- Non lifting of fingerprints or evidences (especially biological)by I.O.
- Non preservation of ceased material.

## 3. Technical lacunae in scientific evidence

- Test not done meticulously.
- No supportive data provided by expert
- Delayed examination by the expert.
- Delayed Report writing

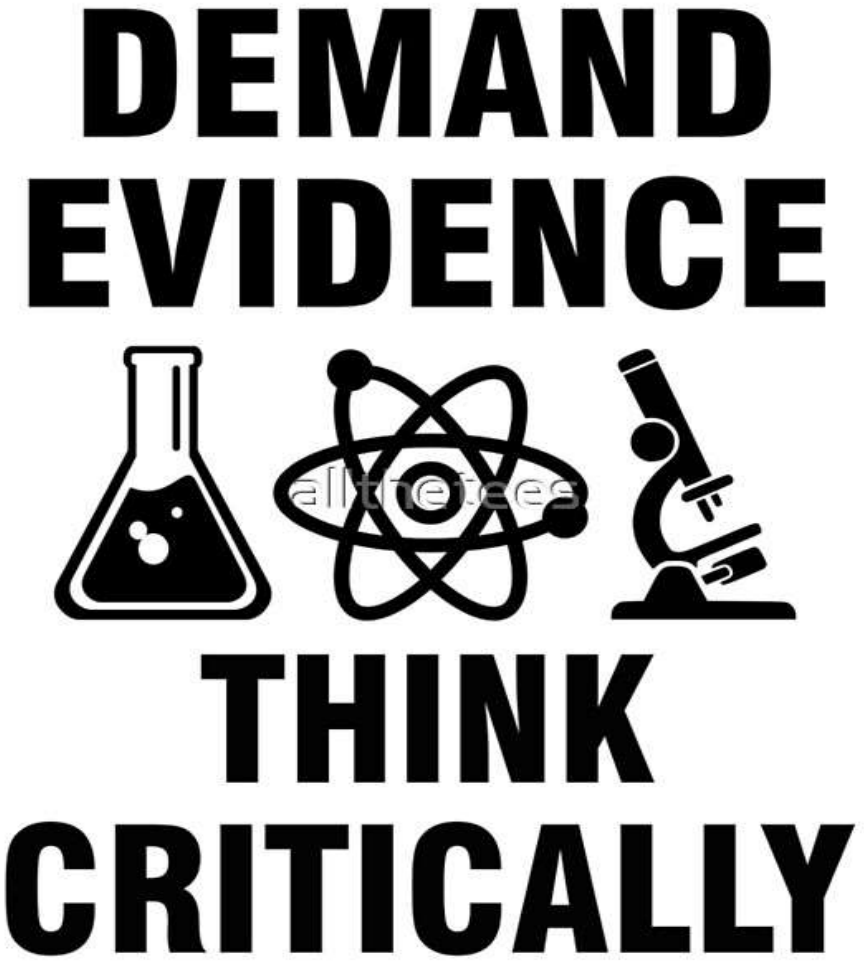
Evidences are precious ..please save it from me in the malkhana
(store room)

# Limitations of Forensic evidences

- Probative value is more rather than corroborative value in crime in dealing with circumstantial evidence
- More often comparative rather than absolute.
- Based on facts and its interpretation.

# Take home message

**Fair reporting and proper preservation of forensic evidence help in delivery of Justice in the court of law**




thank you