Let the evidence speak for itself.
WHAT IS PHYSICAL EVIDENCE?

- Refers to items that can be collected at a crime scene, returned to a lab for examination and possibly brought into a courtroom for observation.

- Examples of this type of evidence include:
  - a bloody shirt,
  - the mold of a foot print,
  - a bullet casing.
WHAT IS TRACE EVIDENCE?

- A very small piece of evidence left at a crime scene that may be used to identify or link a suspect to a crime.

- Trace evidence analysts may use a variety of instrumentation and visualization tools in their analysis of evidence.
THE EFFECT OF CSI...
"Every Contact Leaves a Trace"

- The value of trace forensic evidence was first recognized by Edmund Locard in 1910.

- The Locard’s Exchange Principle states that "with contact between two items, there will be an exchange."
TYPES OF ANALYSIS

- Comparison
- Visual
- Microscopic
- Chemical
Most types of evidence require a control with which to be compared.
VISUAL ANALYSIS
Evidence utilized through unaided observation
MICROSCOPIC ANALYSIS
Evidence observed with a microscope.
Evidence subjected to any type of chemical procedure
TYPES OF CHARACTERISTICS:

- Class Characteristics.
- Individual Characteristics.
CLASS CHARACTERISTICS

Properties that items have in common.

- Forensic science is frequently unable to relate physical evidence to a common origin with a high degree of certainty.
- Evidence is said to have class characteristics when it can only be associated with a group and not a single source.
INDIVIDUAL CHARACTERISTICS —

- Evidence that can be associated with a common source with an extremely high degree of probability is said to possess individual characteristics.

- Something that only 1 particular item on the planet may have – the nicks and cuts on a specific person’s shoe imprints.

- Examples: matching ridge characteristics of 2 fingerprints, or the comparison of random striations on bullets or tool marks.
Paint

• Physical and chemical analysis of paint evidence (chips or residue) can indicate its 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.
PHYSICAL EVIDENCE:

GLASS
Glass

- Glass at a crime scene is analyzed to determine its:
  - color,
  - surface characteristics,
  - tint,
  - thickness,
  - density,
  - chemical composition,
  - refractive index (RI).

Magnified image of glass fragments
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 from a suspect’s car.

The pattern of cracks in a windshield fracture can reveal information about speed, occupant position, and angle of impact.
WHAT CAN GLASS FRACTURES TELL US?
▪ How it was broken.
▪ Link a suspect to a crime scene.
▪ Fingerprints.
▪ Blood.
**TYPES OF FRACTURE LINES**

- **Radial Fracture** - A crack in a glass that extends outward like the spoke of a wheel from the point at which the glass was struck.

- **Concentric Fracture** - A crack in a glass that forms a rough circle around the entry/exit point.
FRACTURES

Concentric

Radial
A projectile hole is inevitably wider on the exit side.
Radial Fractures occur on the surface opposite the initial impact.
STRESS MARKS

- Are shaped like arches that are perpendicular to one glass surface and curved nearly parallel to the opposite surface.
- The perpendicular edge always faces the surface on which the crack originated & on the opposite side from which the force of impact was applied.
- A convenient way for remembering these observations is the 3R Rule- Radial cracks form a Right angle on the Reverse side of the force.
- This will determine the side on which a window was broken.
SUCCESSIVE PENETRATIONS

A fracture always terminates at an existing line of fracture.
Forensic Soil Analysis is the use of soil sciences and other disciplines to aid in criminal investigation.

Soils are like fingerprints because every type of soil that exists has unique properties that act as identification markers.

This means that the origin of the soil sample can be identified.
For example, clay embedded in the sneaker of a criminal can be traced back to a specific clay type found along a lake where a murder victim was discovered.

The majority of soil cases involve footprints or tire marks that have been left in the soil.
**The Unique Properties of Soil Are:**

- **Sediment**—the original solid particles that were weathered from rock.
  - Form due to physical & chemical alteration.

- **Color**—indicates its history as well as the compounds present in the soil:
  - **White or gray** = contains lime or has been leached by a liquid passing through it.
  - **Gray** = organic material or moisture is present.
  - **Black** = suggests the same.
  - **Red, brown or yellow** = iron present.
- **Structure**: indicates whether a soil is composed of a single type of particle or not.
TO EXAMINE THE SAMPLES

- The examiner will first want to use microscopic analysis to perform testing on the mineral content.
- Another test is a density test.
  - This test consists of adding liquid to two glass tubes. After the soil samples become suspended in the liquid the separation of the bands can then be analyzed to reveal the profile of the soil.
Chemical tests can also be done to determine the mineral content of the soil.

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.
BALLISTICS

- The science of mechanics that deals with the launching, flight, behavior, and effects of projectiles.
- In forensics, it typically involves bullets, gravity bombs, rockets, or the like.
WHAT CAN FIREARMS AND AMMUNITION TELL ABOUT A CRIME?

- Circumstances of discharge.
- Link to suspect to crime/victim.
- Link to weapon to crime/suspect.
- Link to victim to suspect.
WHAT CAN POWDER RESIDUE TELL ABOUT A CRIME?

- Provide evidence that a shooting happened.
- Describe the circumstances of the shooting.
- Determine the type of weapon used.
• Characteristics of ammunition, firearms, and residue are examined to find matches between suspects and the evidence found at a crime scene.

• **Rifling (grooves)** in a gun barrel causes distinctive grooves, indentations and scratches upon fired bullets.
  – Police are able to search the **Integrated Ballistics Identification System (IBIS)** database to compare markings from bullets.
- Wound tracks can also be used to identify the type of weapon:
EACH TYPE OF PHYSICAL EVIDENCE DISCUSSED FROM THIS POINT ON WILL HAVE A UNIT DEVOTED TO IT SOMETIME THIS YEAR.
WHAT CAN FINGERPRINTS TELL US?

- Link a suspect the a crime scene/victim.
- Link multiple crimes together.
- Identify suspects/victims.
- AFIS (Automated Fingerprint Identification System) is a database used by investigators to search for matches to fingerprints found at a crime scene.
IMPRESSIONS
Shoeprints & Tire Tracks
- Can be photographed, lifted with tape, or cast with plaster to compare to a suspect’s shoes or tires.
  - Evidence can identify the brand of shoe or tire based on its physical features.
- Shoes and tires will also show wear patterns that can be used to match evidence to specific items.

Bite Marks
- Each of the 32 teeth in humans is unique due to age and wear & can often be matched to dental records.

Tool Marks
- Tiny nicks and chips form on the edges of a tool as it is used.
- Tools may also pick up traces of blood or other substances.
Documents:

- Finding handwriting matches.
- Typewriter or Printer matches.
- Authenticity of documents.
Examiners will analyze a 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,
- handwriting style,
- type of ink.
Wounds
• Wounds can often be matched to weapons or tool marks on the weapon.
• A wound may provide clues to characteristics of the suspect:
  – left-handed or right-handed,
  – height,
  – positions of the victim and suspect at the time of the incident.
Insects

• The study of insects is called Entomology. When applied to crime scene investigation, it is called Forensic Entomology.

• Flies, beetles, and other insects can provide useful clues about a corpse:
  – Approximate time of death,
  – Environment,
  – Circumstances of death.
DNA

- Investigators can extract DNA from almost any tissue, including:
  - hair,
  - fingernails,
  - bones & teeth.
  - 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.
Skeletal Remains

- Forensic anthropologists analyze skeletal remains to determine four characteristics for a victim:
  - age,
  - sex,
  - race,
  - stature (height/build).

- They may also be able to gain clues as to a person’s past, recent injuries, or the cause of death based on bone fractures and trauma.
HAIR

- Can be used to determine the following:
  - What species?
  - How it was removed.
  - Match to a person through DNA.
  - Race and body region the hair came from.
FIBERS

- Can be used to:
- Link suspect to a location or victim.
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.