BLOODSTAIN PATTERN ANALYSIS & CRIME SCENE RECONSTRUCTION
CRIME SCENE RECONSTRUCTION

- A method used to support a likely sequence of events by the observation and evaluation of physical evidence.

- Crime-scene reconstruction relies on the combined efforts of medical examiners, criminalists, and law enforcement personnel to recover physical evidence and to sort out the events surrounding the occurrence of a crime.
RECONSTRUCTION PATTERNS

Reconstruction patterns:
- Reconstruction patterns are those that are primarily used to reconstruct past events
- Examples include blood spatter, glass fractures, fire burn, and track and trail patterns

Individualization patterns:
- Individualization patterns are those which have the potential to be associated with an item or person responsible for it
- Examples include: fingerprints, palm prints, footprints, handwriting, and toolmark patterns
DOCUMNTATION PROCESS OF RECONSTRUCTION PATTERNS

- Many reconstruction patterns cannot be collected or transported to the laboratory.
- Many are part of the scene itself, and in some cases, the integrity of the pattern is a function of the scene being left undisturbed.
- In other cases, the pattern may no longer exist after the scene is processed and released.
- Thus thorough documentation of the pattern evidence is important.
What can an investigator learn from the analysis of a blood spatter?

- Type and velocity of weapon
- Number of blows
- Handedness of assailant (right or left-handed)
- Position and movements of the victim and assailant during and after the attack
- Which wounds were inflicted first
- Type of injuries
- How long ago the crime was committed
- Whether death was immediate or delayed
Factors Affecting Blood Patterns and their Interpretation

- Target surface absorbency, surface texture, and blood volume are important variables in blood pattern formation.
- Different surfaces react differently.
- Other factors include force, distances, motion, ambient temperature, and air currents.
- Activities of various individuals at the scene (victim, suspect, police etc.) can change the appearance of a pattern and complicate the interpretation.
A pattern of dried blood on a surface resulting from an event which caused blood to exit the body

Droplets of blood falling or projected through space follow standard laws of physics

Due to the physical properties of blood, predictable patterns form when it falls or is projected through the air

Blood spatter patterns are often classified as low, medium, or high velocity
- **Low-velocity patterns** are formed by blood falling onto a surface influenced only by the force of gravity.
- **Medium-velocity patterns** are due to moderate forces, forming droplet stains which are smaller than those from low-velocity.
- **High-velocity patterns** are formed as a result of extreme forces, producing very small droplet stains.
**BLOODPATTERN STAIN ANALYSIS**

**VOCABULARY**

**Spatter** – Bloodstains created from the application of force to the area where the blood originated.

**Origin/Source** – The place from where the blood spatter came from or originated.

**Angle of Impact** – The angle at which a blood droplet strikes a surface.

**Parent Drop** – The droplet from which a satellite spatter originates.

**Satellite Spatters** – Small drops of blood that break of from the parent spatter when the blood droplet hits a surface.

**Spines** – The pointed edges of a stain that radiate out from the spatter; can help determine the direction from which the blood traveled.
Various Blood Spatter Patterns

**Passive Bloodstains**
- Patterns created from the force of gravity
- Drop, series of drops, flow patterns, blood pools, etc.

**Projected Bloodstains**
- Patterns that occur when a force is applied to the source of the blood
- Includes low, medium, or high impact spatters, cast-off, arterial spurting, expiratory blood blown out of the nose, mouth, or wound.

**Transfer or Contact Bloodstains**
- These patterns are created when a wet, bloody object comes in contact with a target surface; may be used to identify an object or body part.
- A wipe pattern is created from an object moving through a bloodstain, while a swipe pattern is created from an object leaving a bloodstain.
TYPES OF BLOODSPATTER

- A pattern created by blood that is expelled from the mouth or nose from an internal injury is called an **expired blood pattern**.

- A **void** is created when an object blocks the deposition of blood spatter onto a target surface or object.

- When an object with blood on it touches one that does not have blood on it, this produces a **contact or transfer pattern**.
  - Examples of transfers with features include fingerprints, handprints, footprints, footwear prints, tool prints, and fabric prints in blood.
Patterns made by drops or large amounts of blood flowing by the pull of gravity are called **flows**.

A pool of blood occurs when blood collects in a level (not sloped) and undisturbed place.

The edges of a stain will dry to the surface, producing a phenomenon called **skeletonization**.

A **trail pattern** is a series of drops that are separate from other patterns, formed by blood dripping off an object or injury.
Angle of Incidence & Directionality

- The direction of travel of blood striking an object may be discerned because the pointed end of a bloodstain always faces its direction of travel.

- The impact angle of blood on a flat surface can be determined by measuring the degree of circular distortion. At right angles the blood drop is circular, as the angle decreases, the stain becomes elongated.
The shape of a blood spatter stain reflects the angle at which it impacted the surface.

A droplet falling at a right angle to a surface forms a circular stain. As the angle changes, the stains become more elliptical.

The angle of incidence is the angle at which a blood droplet impacts a surface, measured with respect to an imaginary line perpendicular to that surface.
The angle of incidence can be estimated from the shape of the blood spatter stains using trigonometric principles. The major (long) and minor (short) diameters of the stain are measured and the ratio of the minor to major dimensions is calculated. The ratio value equals the cosine of the angle of incidence, theta ($\theta$)

$$\cos \theta = \frac{\text{minor diameter}}{\text{major diameter}}$$
The origin of a blood spatter in a two-dimensional configuration can be established by drawing straight lines through the long axis of several individual bloodstains. The intersection or point of convergence of the lines represents the origin point (where it happened).
DOCUMENTING BLOODSTAIN EVIDENCE

- Investigators should note, study, and photograph each pattern and drop of blood to accurately record the location of specific patterns and to distinguish the stains from which laboratory samples were taken.

- The investigator should create photographs and sketches of the overall pattern to show the orientation of the pattern to the scene.

- Two common methods of documenting bloodstain patterns are the grid method and the perimeter ruler method.
Wound, Injury, or Damage Patterns

- Wound and injury patterns refer to evidence on the human body.
- The pattern evidence helps a pathologist determine whether the wounds and injuries observed are consistent with specific events (e.g. gunshot, blunt force, cutting).
- Wound and injury patterns must be carefully considered in any reconstruction of a murder case.