Presentation On Blood Stain Pattern Analysis

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Introduction

- Blood is one of the most significant & frequently encountered types of physical evidence in forensic investigation of death & violent crimes

- Bloodstain Pattern analysis is the examination of the shapes, location & distribution patterns of bloodstains, in order to provide an interpretation of the physical events which give rise to their origin

History

- Dr. Eduard Piotrowski, assistant at the institute of Forensic Medicine at Poland, published first paper on Blood Spattering in 1895.

- It was followed by French scientist Dr. Victor Balthazard.

- Most profound work was done by professor Herbert Leon MacDonell who had three publications and several books written on Blood Spattering from 1971 to 1982.

Information that are likely to be discovered…

1. Thedirection a given droplet was traveling at the time of impact.
2. The angle of impact.
3. The probable distance from the target from which the droplet originated.
4. The nature of the force involved.
5. The nature of object used.
6. The relative position of the suspect, victim and other related objects.
7. The approximate numbers of blows struck during an incident.
8. Sequencing of multiple events associated with an incident

- **Confirm or refute assumptions concerning events and their sequence:**

-Position of victim. (standing, sitting, lying)
-Evidence of a struggle. (blood smears, blood trails)

- **Confirm or refute statements made by principals in the case:**

-Are stain patterns on a suspects clothing consistent with his reported actions?
-Are stain patterns on a victim or at a scene consistent with accounts given by witnesses or the suspect?

Properties of Blood

- Viscosity

- Specific Gravity

- Surface Tension

Categories of Bloodstain Patterns

A. **Passive Bloodstains**

Passive Bloodstains are drops created or formed by the force of gravity acting alone. It can be further sub-divided to include:

•Drops

•Drip patterns

•Pools

•Clots

Drip Pattern

Pool Pattern

B. Transfer Bloodstains

It is created when a wet, bloody surface comes in contact with a secondary surface. It is further sub-divided as:

- Contact Bleeding
- Swipe or smear
- Wipe
- Smudge

C. Projected Bloodstains

These are created when an exposed blood source is subjected to an action or force, greater than the force of gravity. It can be divided into:

- **Arterial Spurt**

    Bloodstain pattern(s) resultingfrom blood exiting the body under pressure from a breached artery

- **Cast-off Stains**

    Blood released or thrown from a blood-bearing object in motion
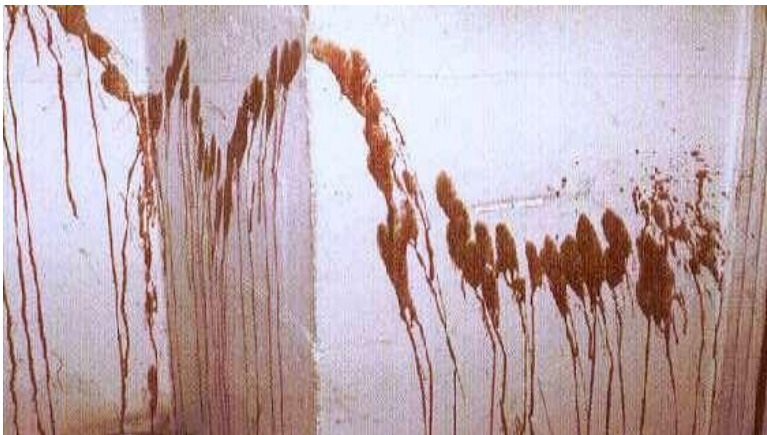
- **Impact Spatter**

Blood stain patterns created when a blood source receives a blow or force resulting in the random dispersion of smaller drops of blood.
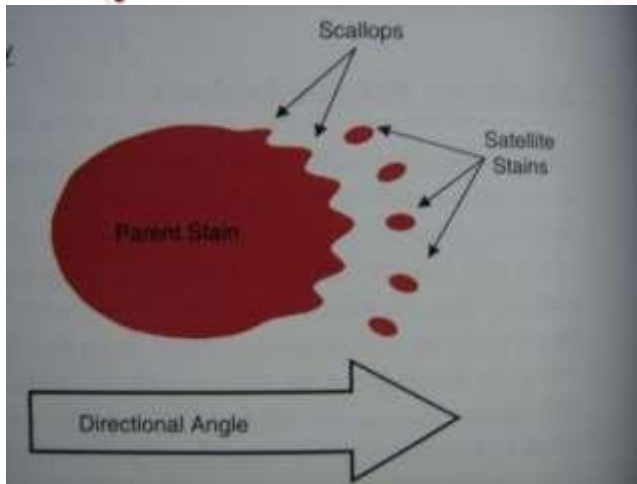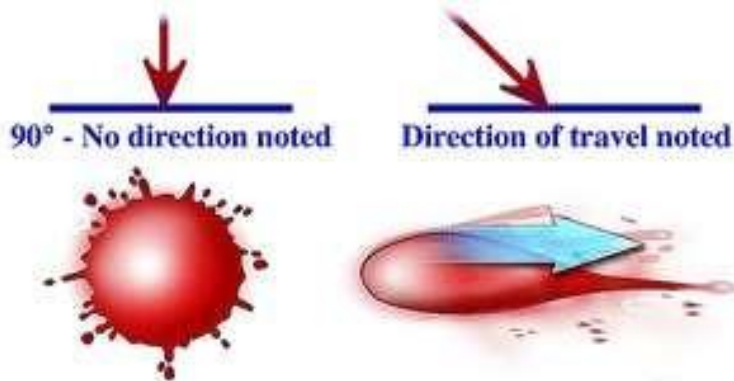
It can be sub-divided into:

- Low-velocity Impact

- Medium-velocity Impact

- High-velocity Impact
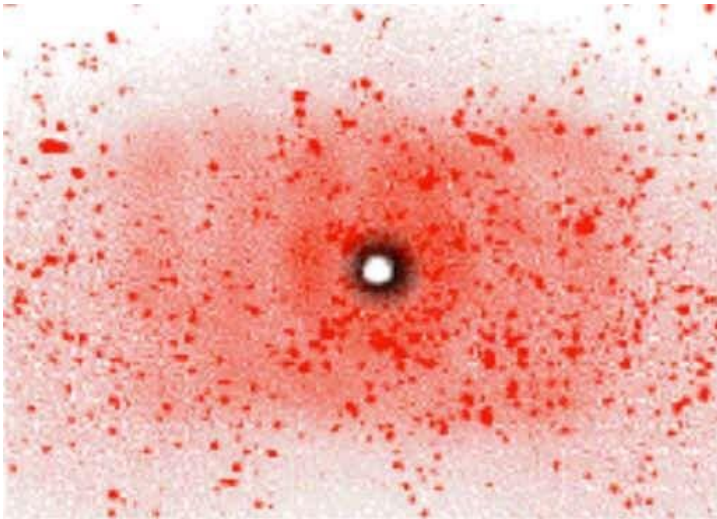
Directionality of Bloodstain

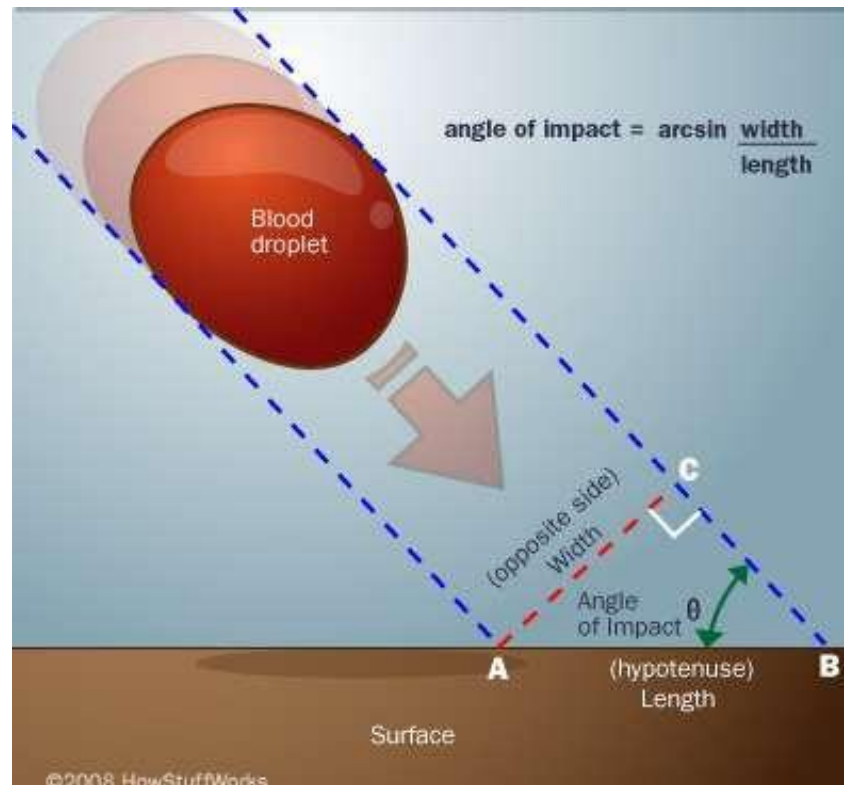- It indicates or relates the path droplet followed at the time it impacted the target
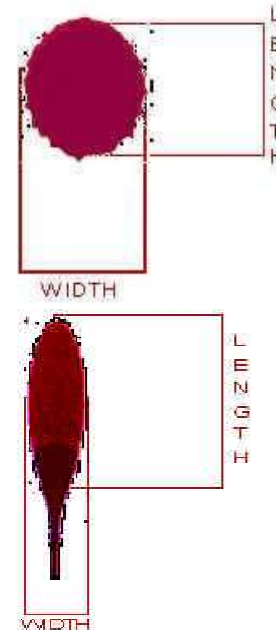
Impact Angle Determination

- It is the acute angle formed between the direction of the blood drop and the plane of the surface it strikes
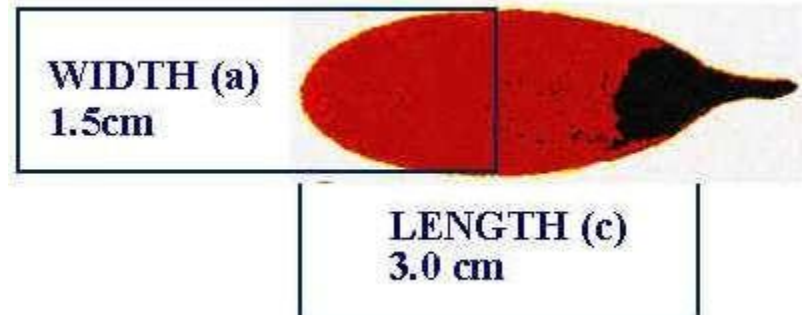
- sinθ=opposite/hypotenuse

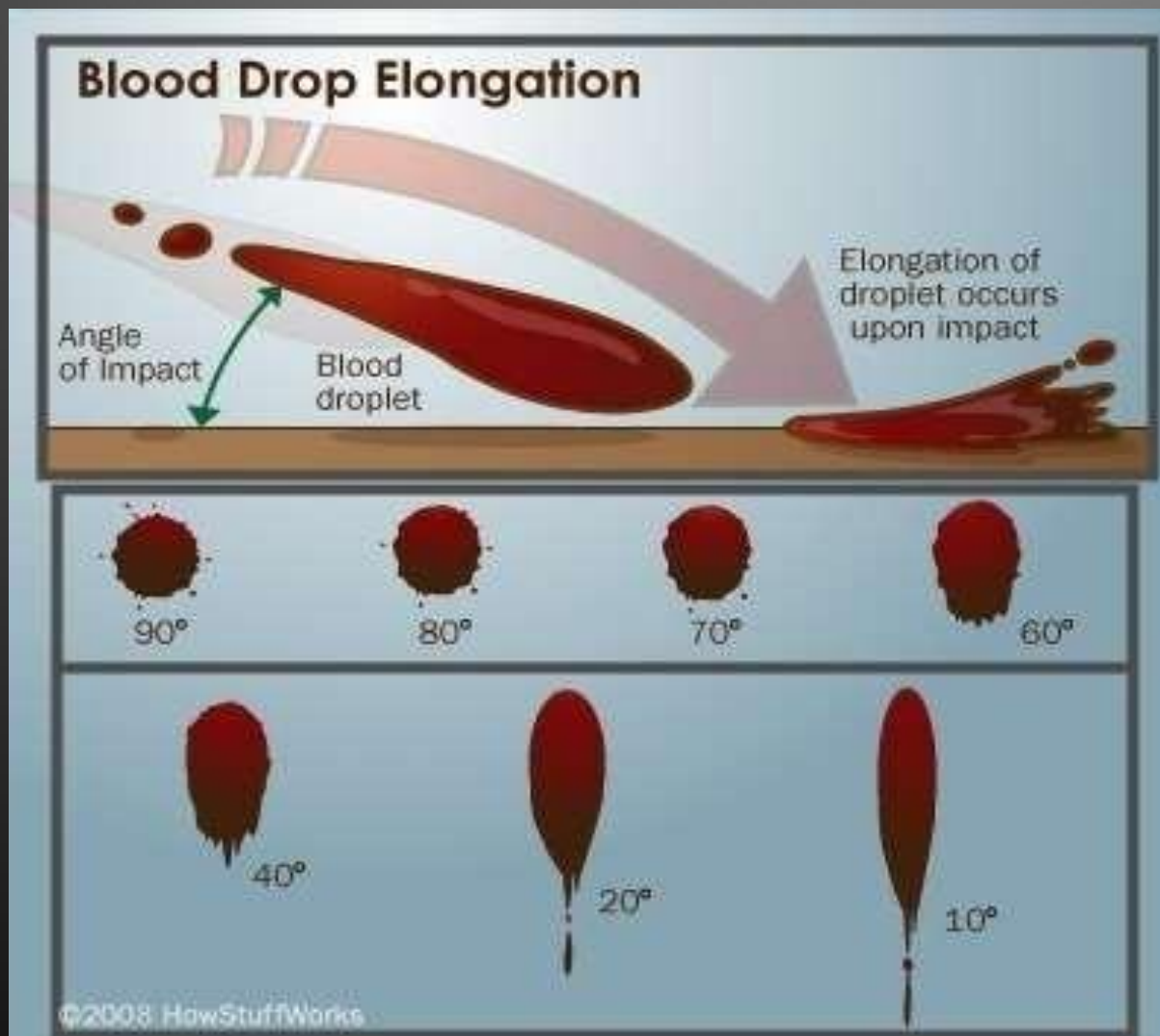i.e. sinθ=width/length of the droplet

e.g. width=1.5cm length=3.0cm

sin θ= Width   (a) 1.5cm Length (c) 3.0cm
sin θ= 0.5

θ= 30 degrees

WIDTH (a)
1.5cm

LENGTH (c)
3.0 cm

Impact of Angle on Bloodstain Pattern Shape

The diameter of the bloodstains increases as the height increases

7 ft
6 ft
5 ft
4 ft
3 ft
2 ft
1 ft
6 In

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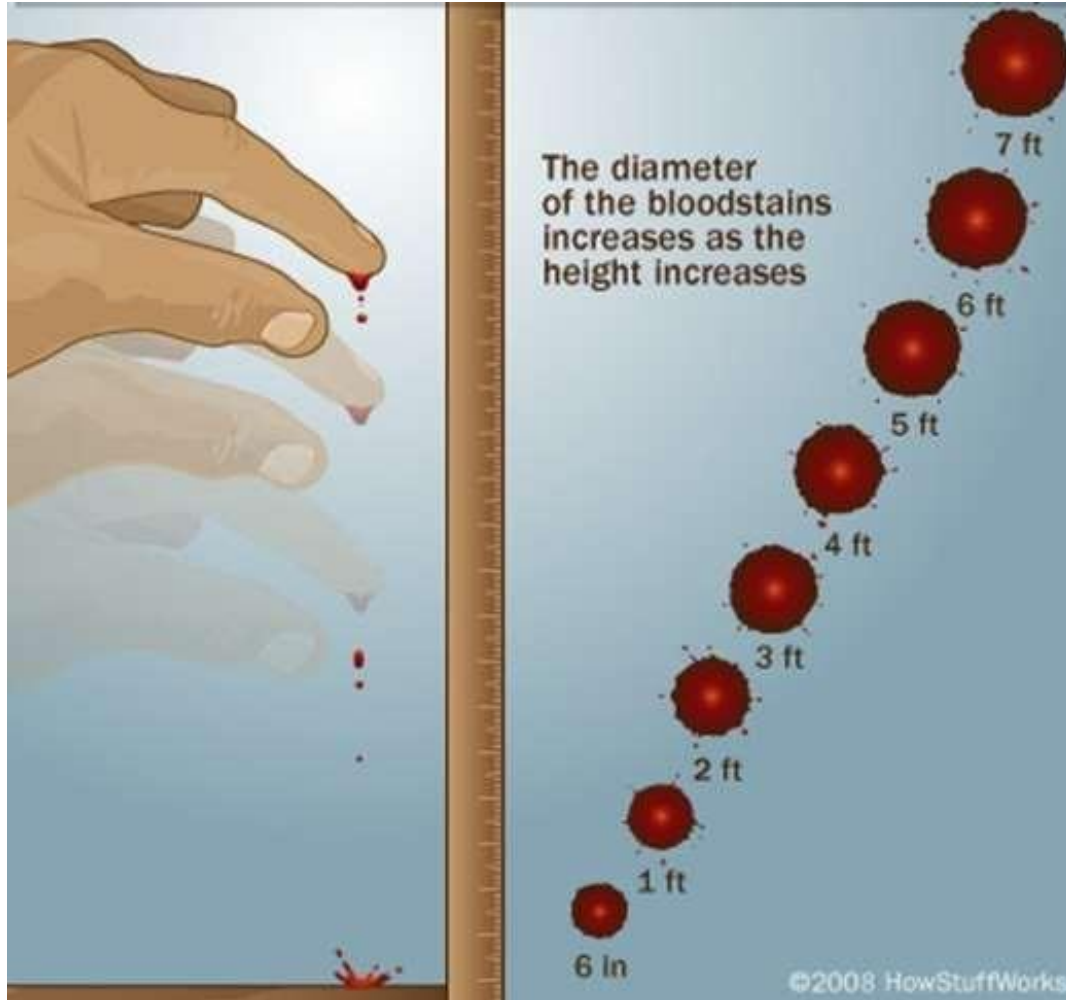
Target Surface and Stain shape


Linoleum surface

Cardboard surface

Smooth Glass surface

Point of Convergence

- The common point, on a 2 dimensional surface, over which the directionality of several bloodstains can be retraced.

- By drawing a line through the long axis of a group of bloodstains the point of convergence can be determined. Where the lines of the group of stains intersect one another the convergence point can be established.
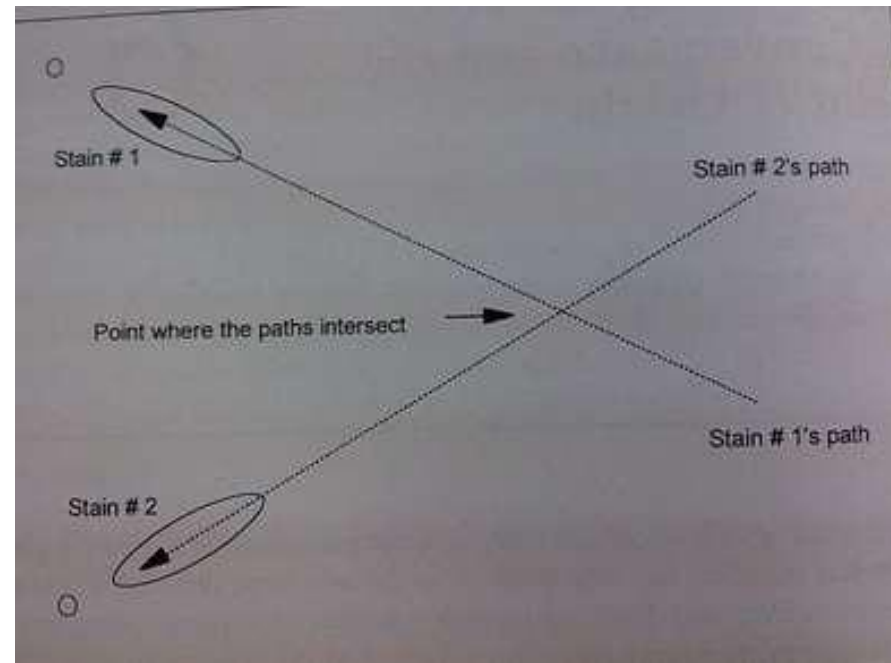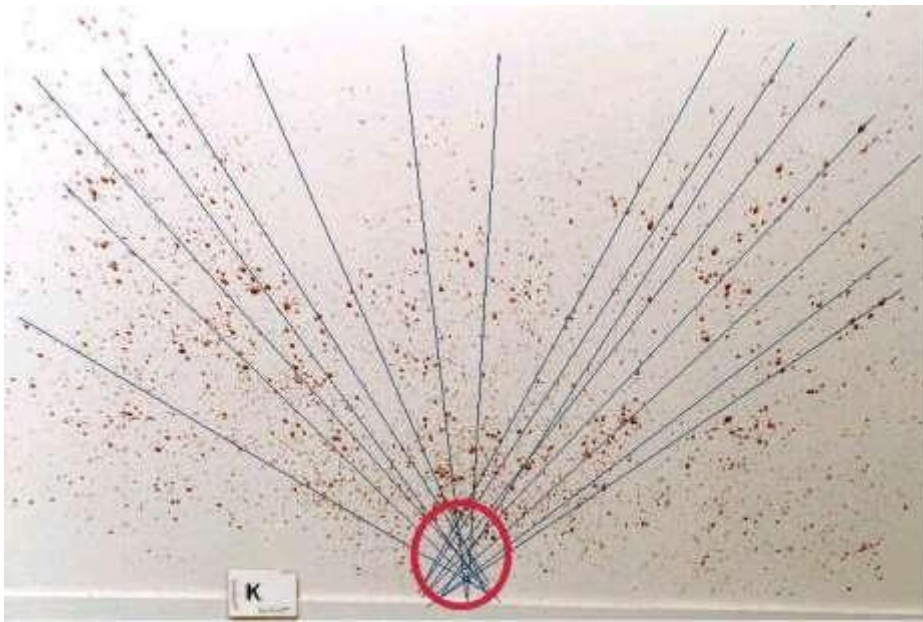
Point of Origin

- The point of origin is the location from which the blood that produced the bloodstain originated

- It can be constructed graphically by plotting the distance from point of convergence with their angle of impact on target surface
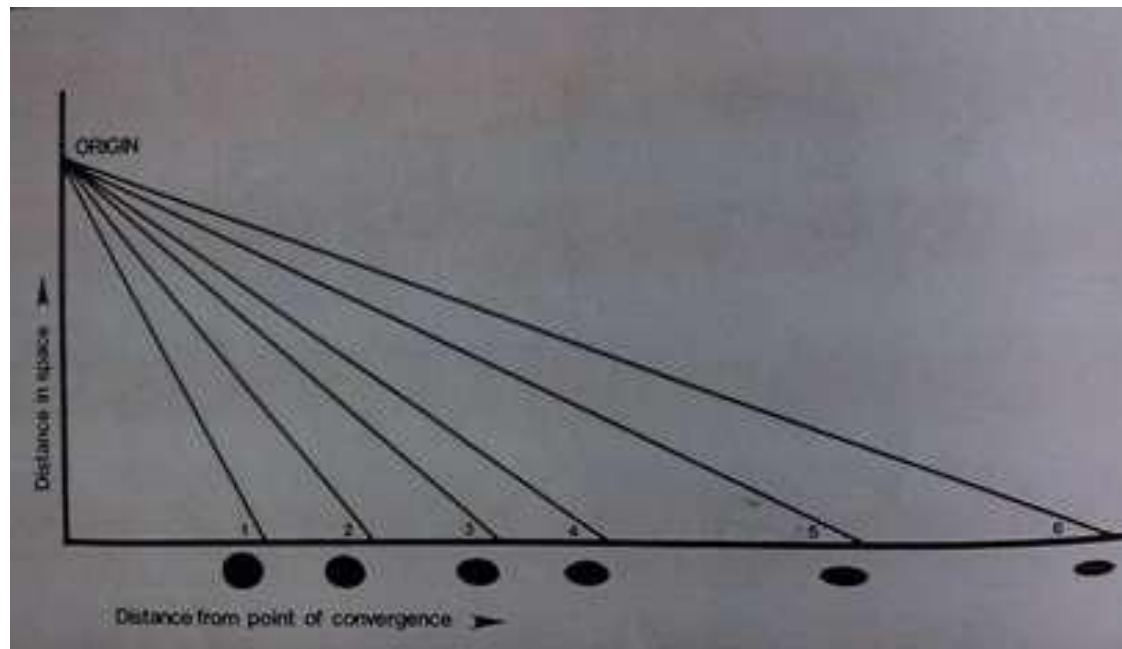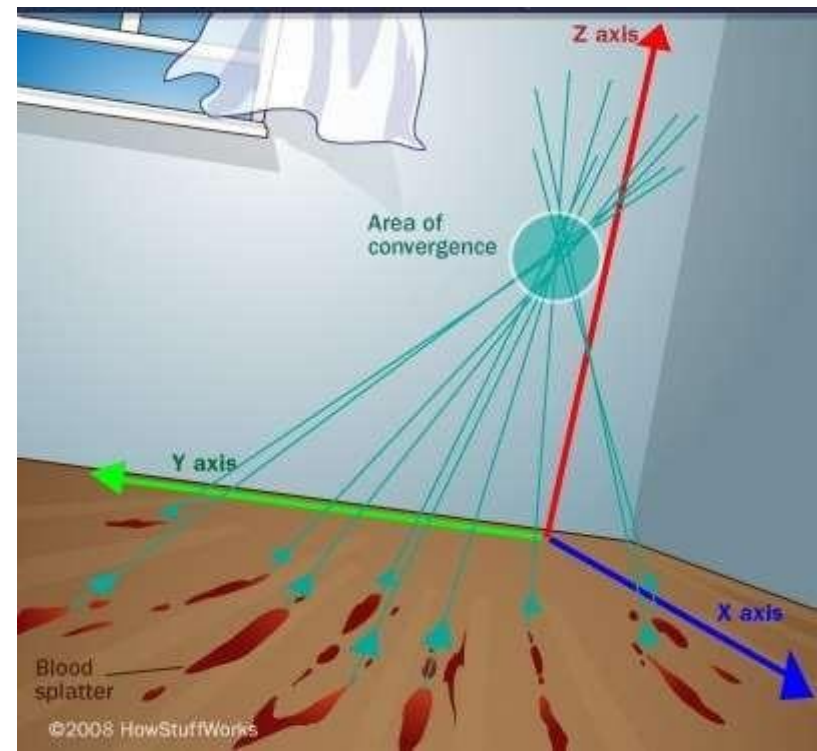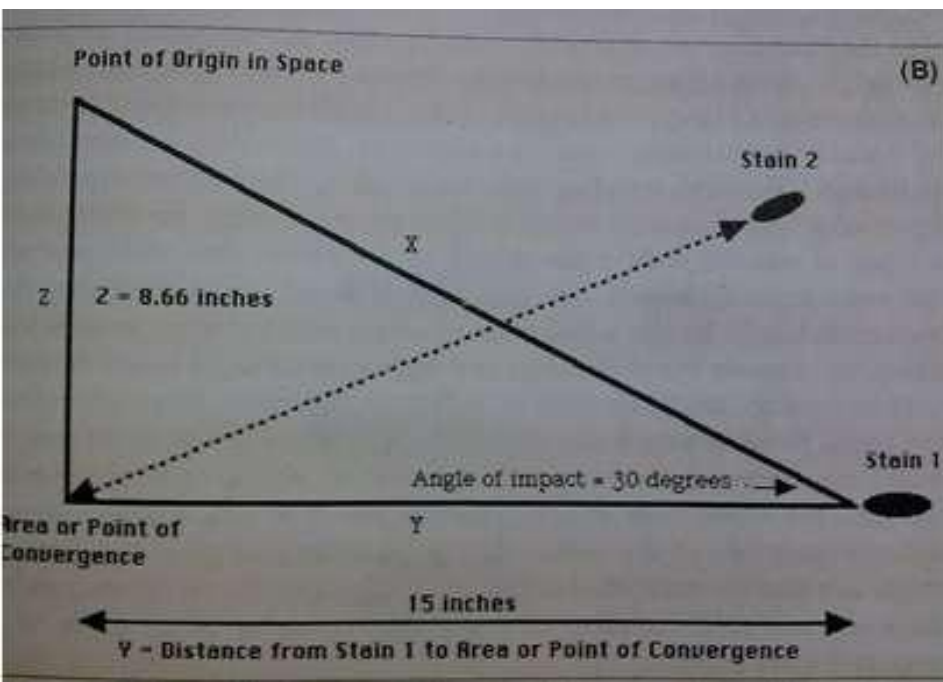
- The point of origin may also be determined by the tangent method

Tangent of angle of impact= opposite/adjacent or Z/Y

Point of origin or Z = Tan of angle of impact x Y Z

$$= \text{Tan of 30 degrees} \times 15''$$

Z = 0.5773 x 15 = 8.66"

Point of Origin in Space

(B)

Stain 2

X

Z   Z = 8.66 inches

Area or Point of Convergence

Angle of impact = 30 degrees

Stain 1

Y

15 inches

Y = Distance from Stain 1 to Area or Point of Convergence

Z axis

Area of convergence

Y axis

X axis

Blood splatter

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This person was struck several times in the head and face with a hammer, which resulted in the deposition of numerous blood spatters on the wall behind the couch. The black lines are strings placed along the long axis of individual stains. The point where the strings converge indicate the victim's head was near that area as the blows were struck. This information combined with estimated angle of impact allow the investigator to determine an approximate location from which the spatter originated.

I will request you, students please go through to this presentation a couple of times and get back to me (ssingh35@ bhu.ac.in) if you have any question?

Thanks