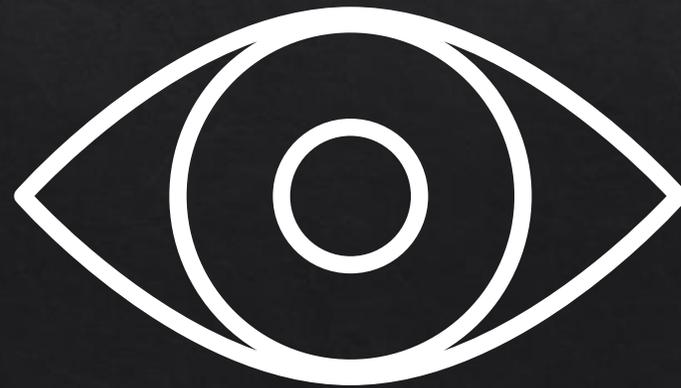


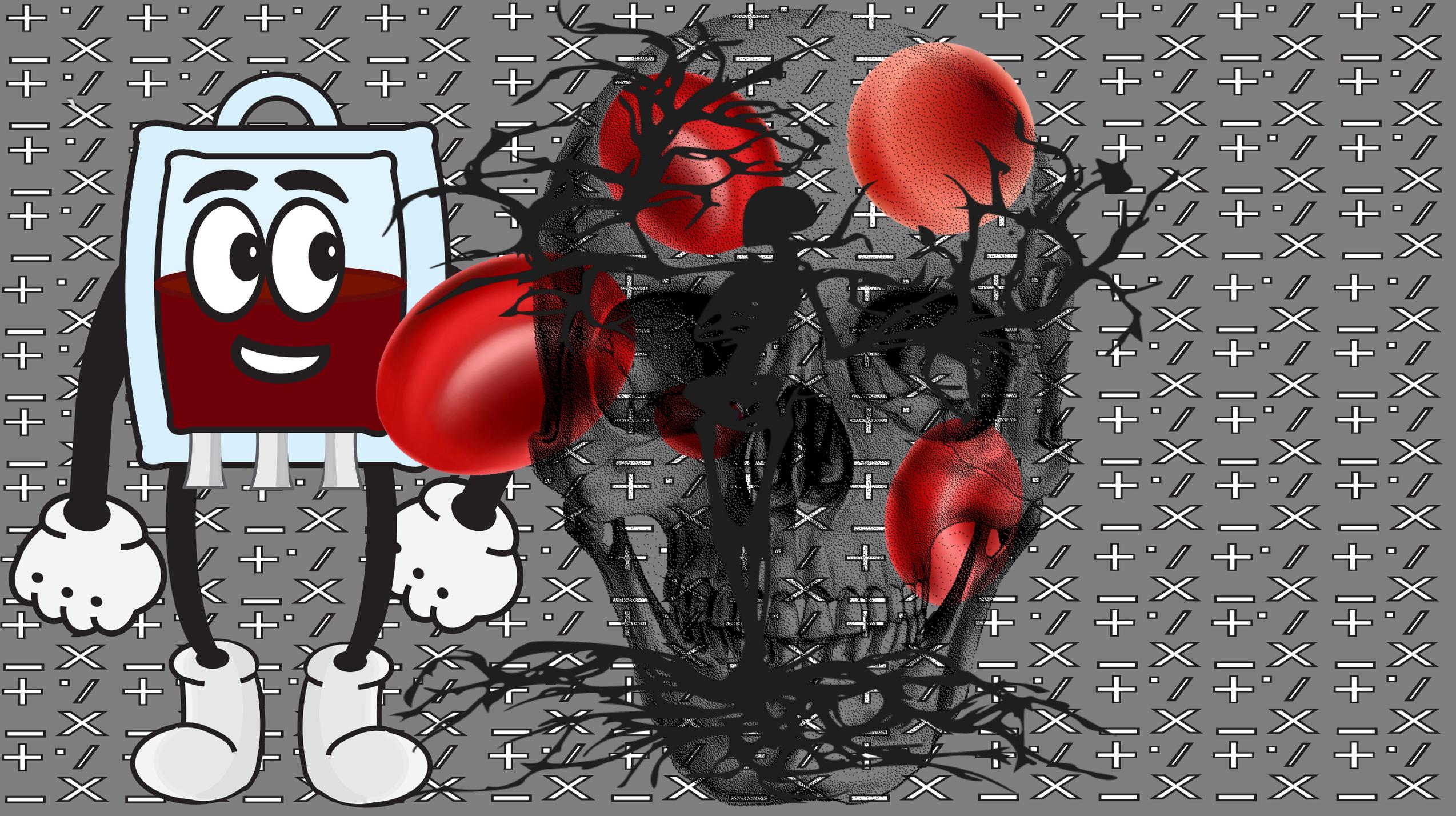
Blood: The Crime Scene Poet

Cheyenne Kaylei Shepherd

Content Warning

The following presentation contains graphic images and demonstrations of blood that may be traumatizing to some audiences.





Components of Blood

Red Blood Cells (40 – 45 %)

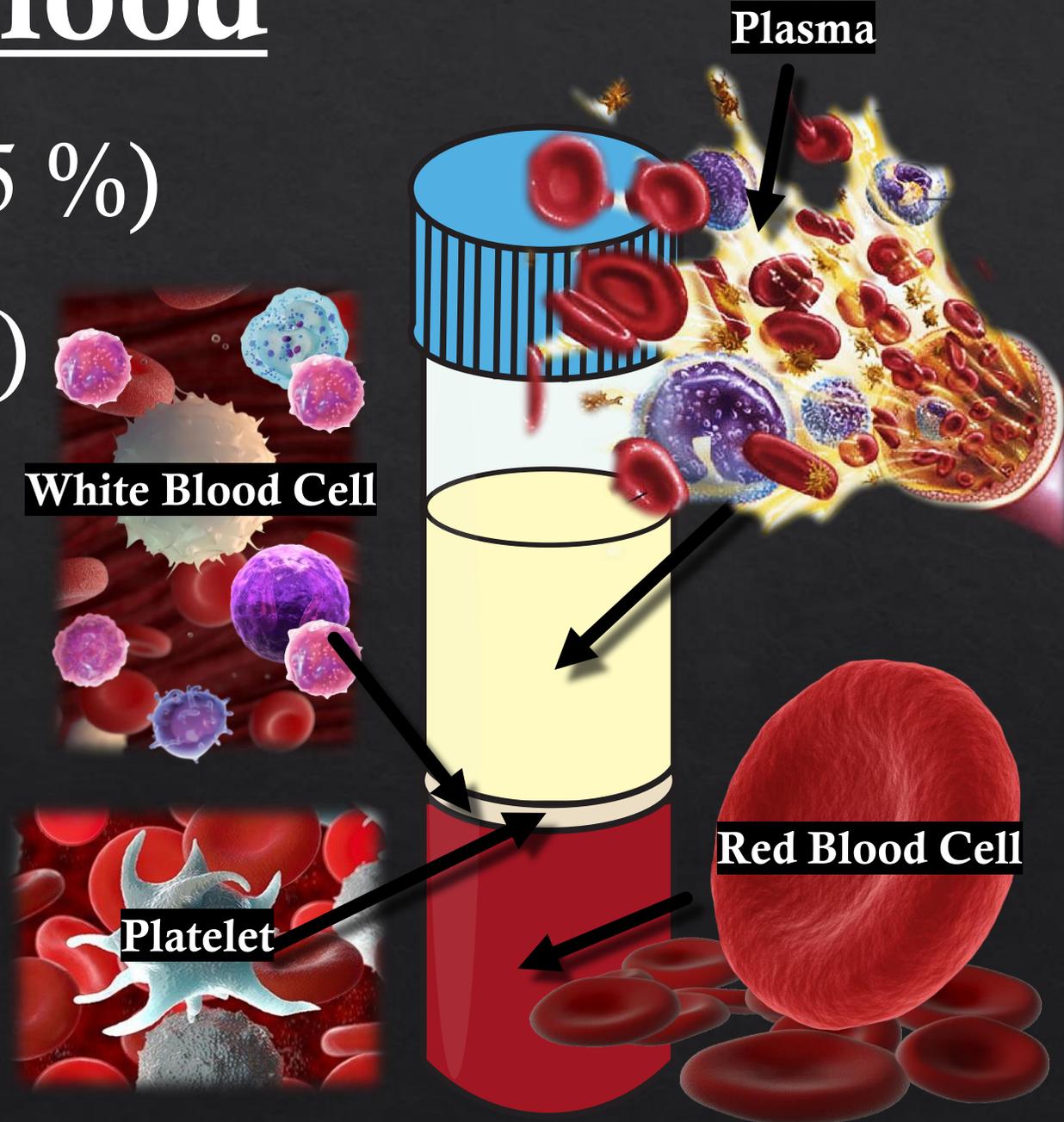
White Blood Cells (1 %)

Platelets (1 %)

Plasma (55 %)

Sticky

Small, Smooth, Stick, Clot



Surface Properties

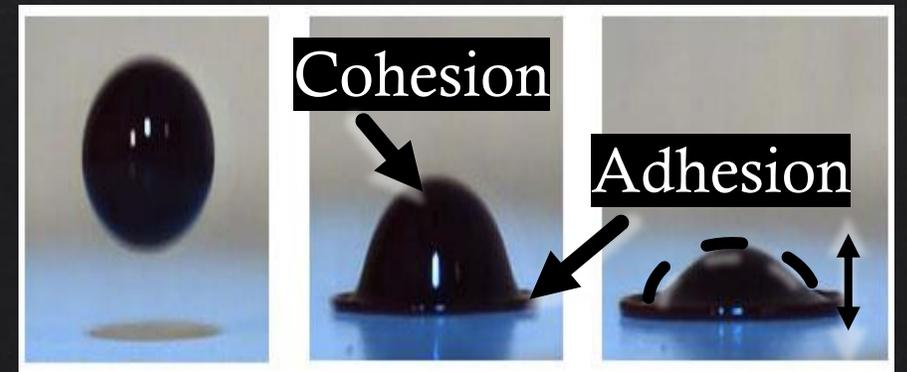
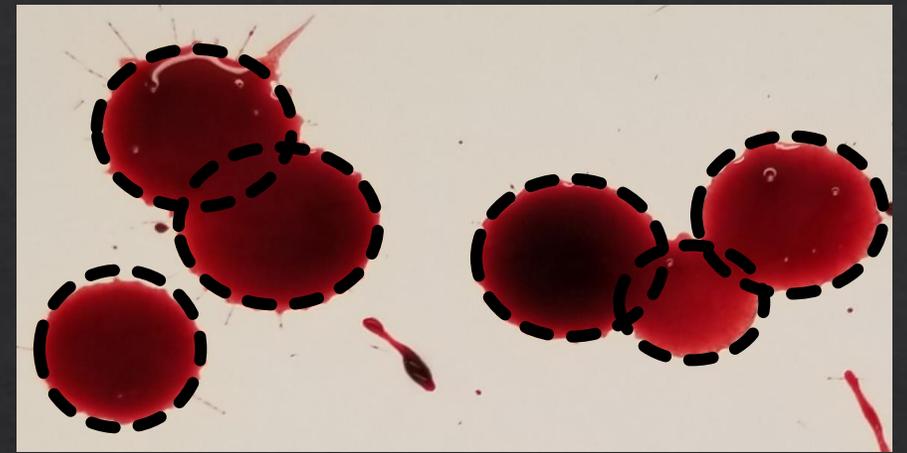
Elliptical Shape

Internal Forces

Surface Tension

Cohesion

Adhesion



Flight Path

Trajectory of flight

Pathway

Impact Site \rightarrow Target

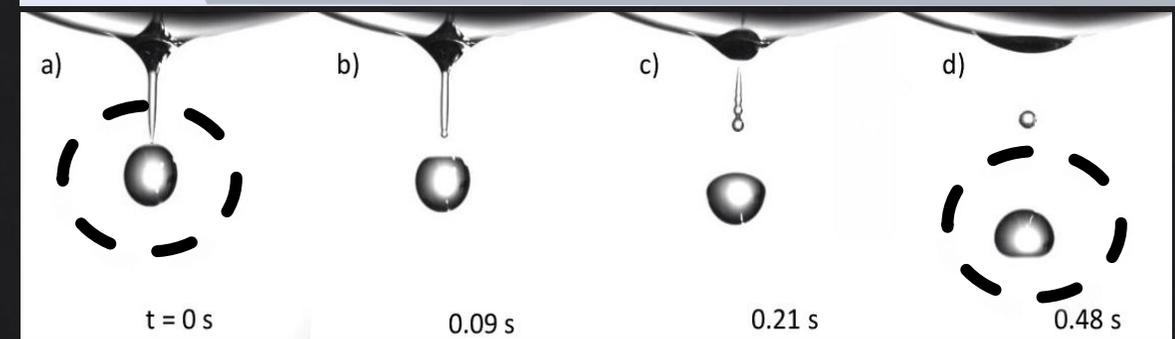
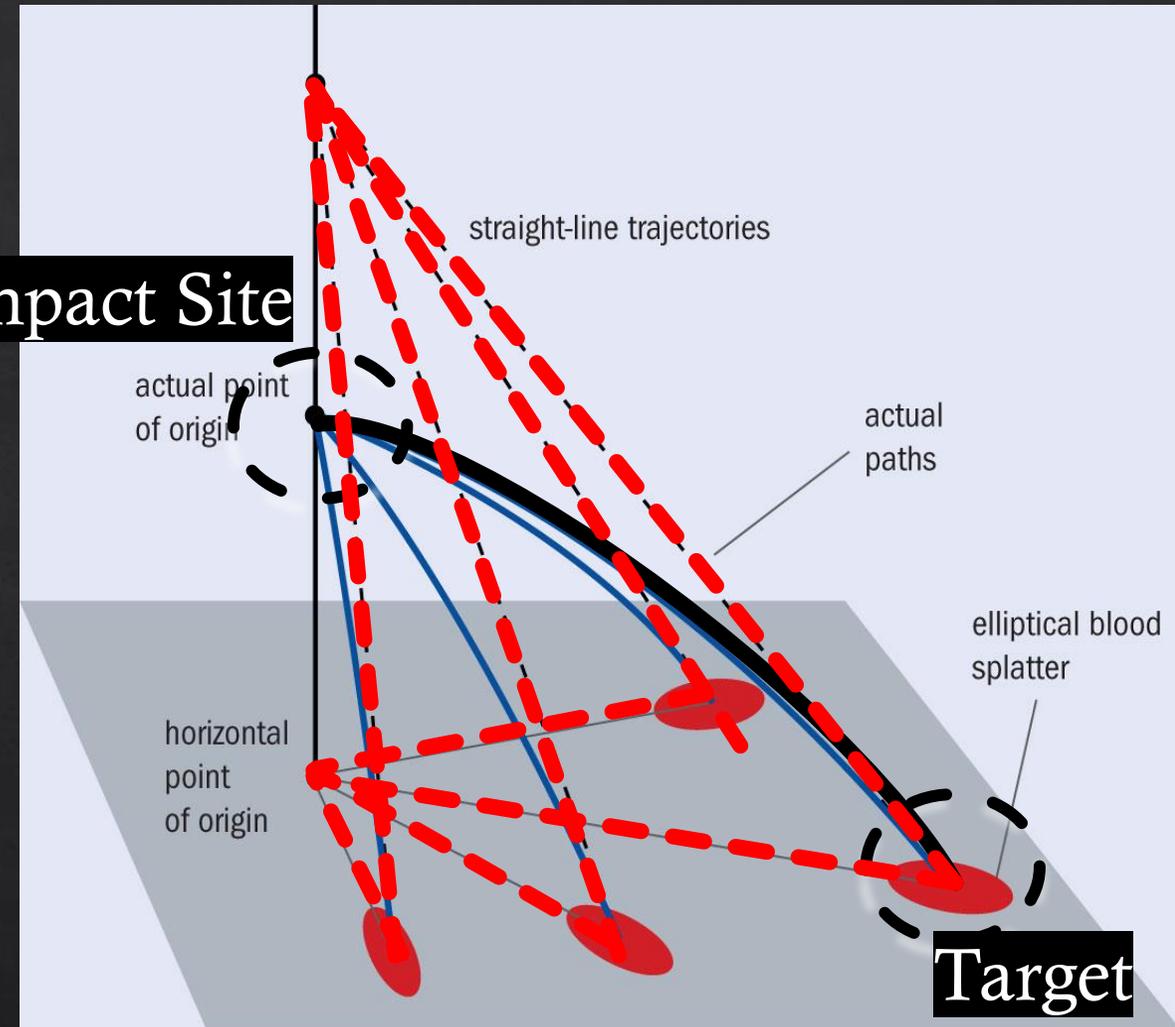
Aerodynamics

Gravitational Forces

Drag and Gravity

Force \rightarrow Deformity

Impact Site



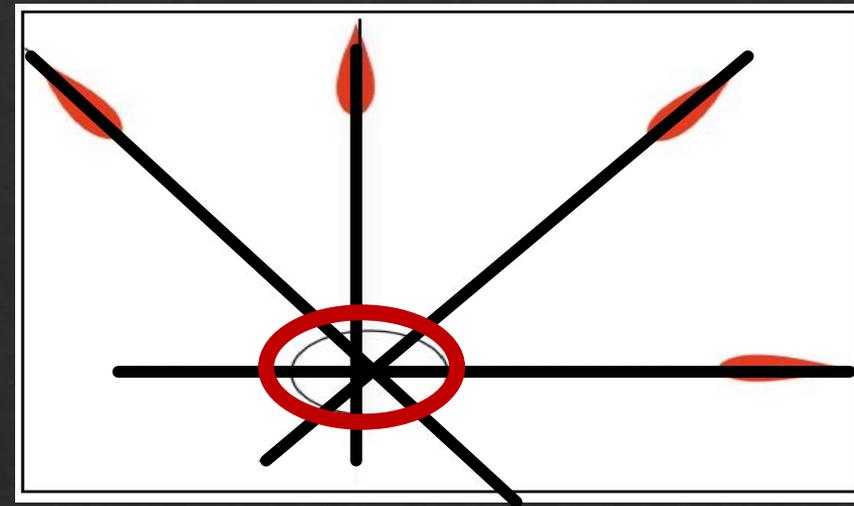
Area of Convergence

Origin of Droplets

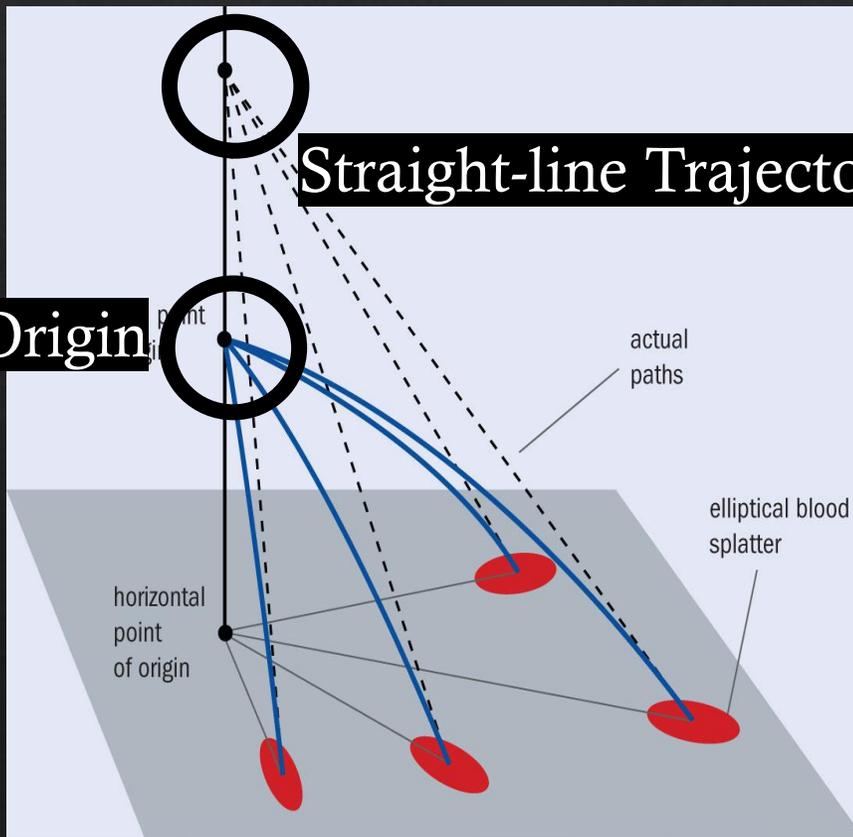
Individual Path

Cross-over

Single Point



Actual Point of Origin

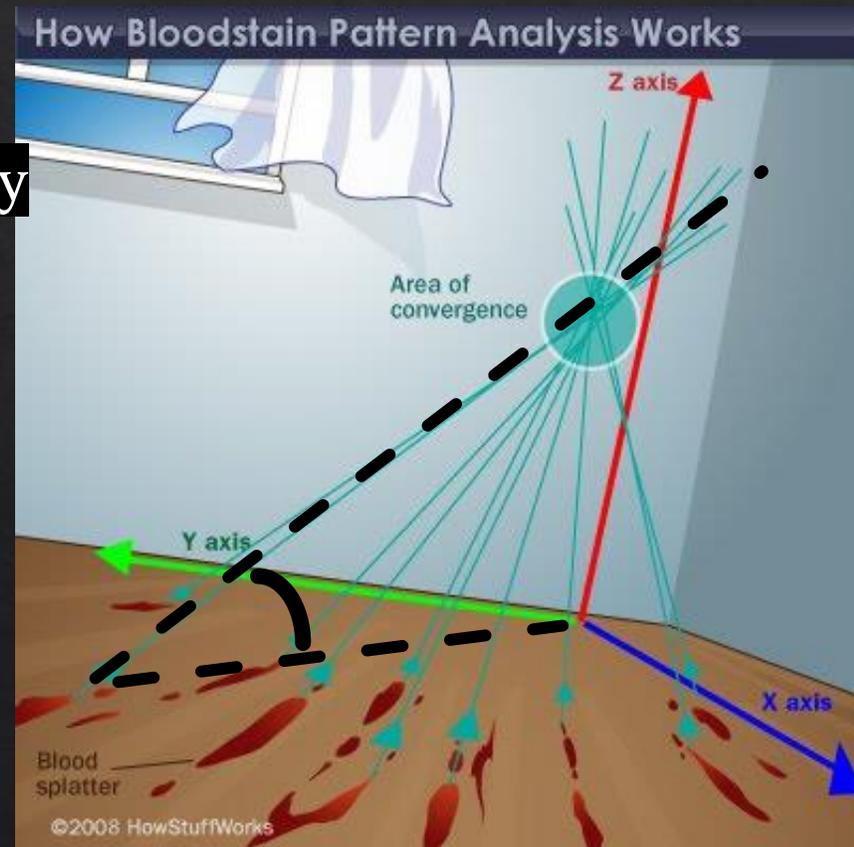


Straight-line Trajectory

actual paths

elliptical blood splatter

horizontal point of origin



How Bloodstain Pattern Analysis Works

Area of convergence

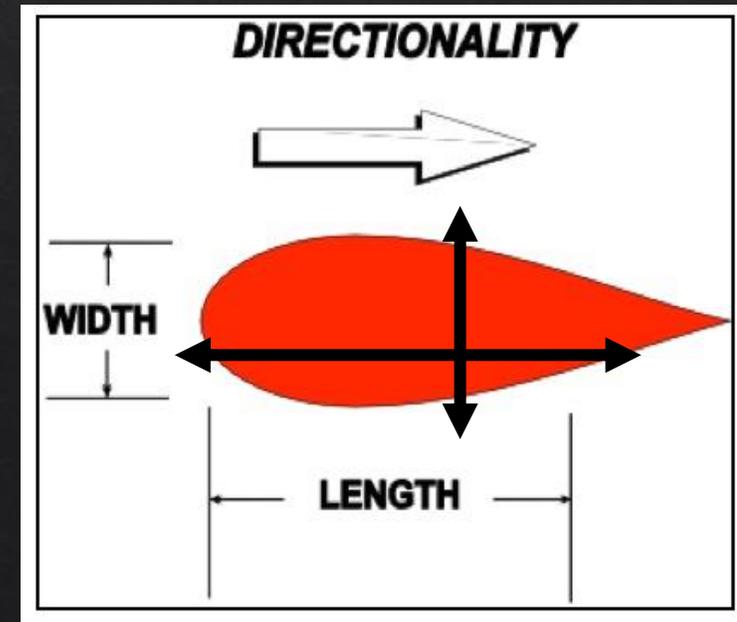
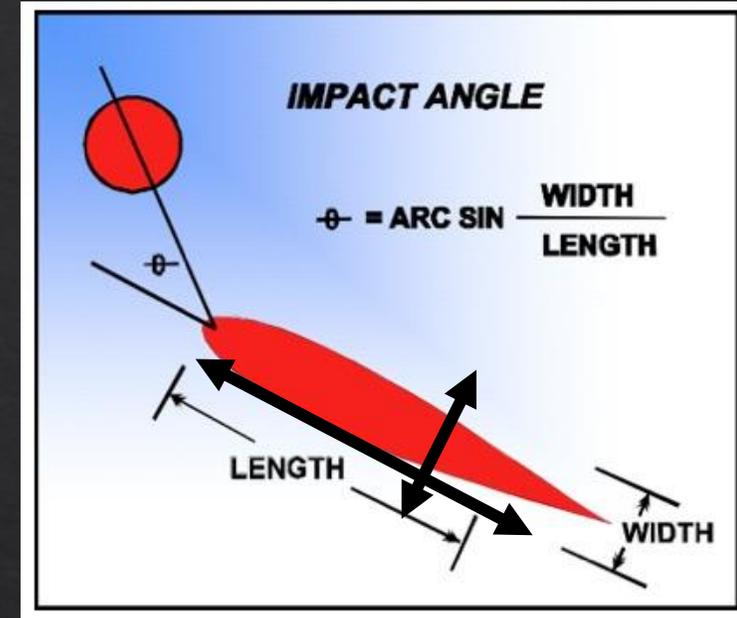
Blood splatter

©2008 HowStuffWorks

Angle of Impact

Width and Height of a Droplet

$$\text{Inverse sine} = \frac{\text{Width}}{\text{Length}}$$

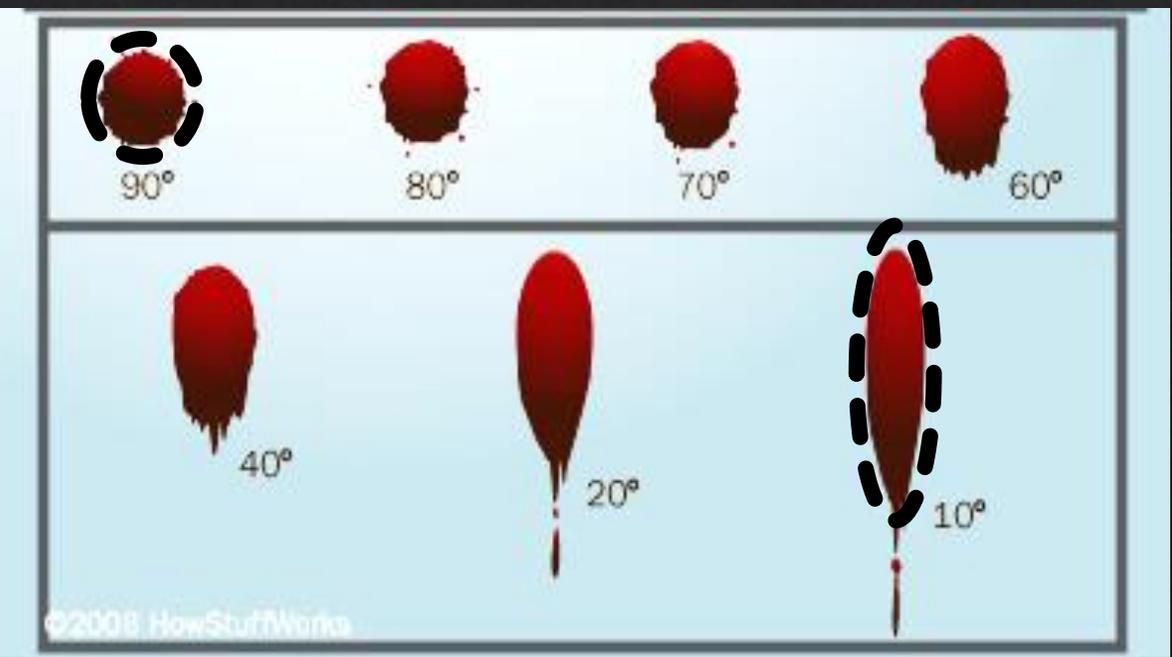
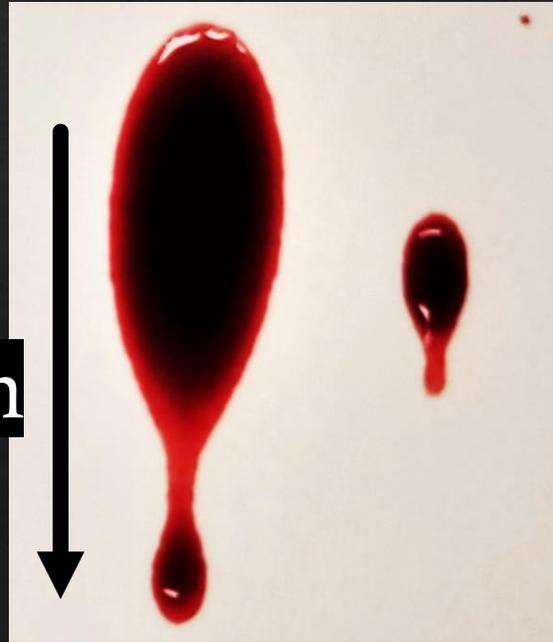


Elongation

↓ Angle

Elongation ↑

How Bloodstain Pattern Analysis Works



Spines

Spikes

Outlined Edges

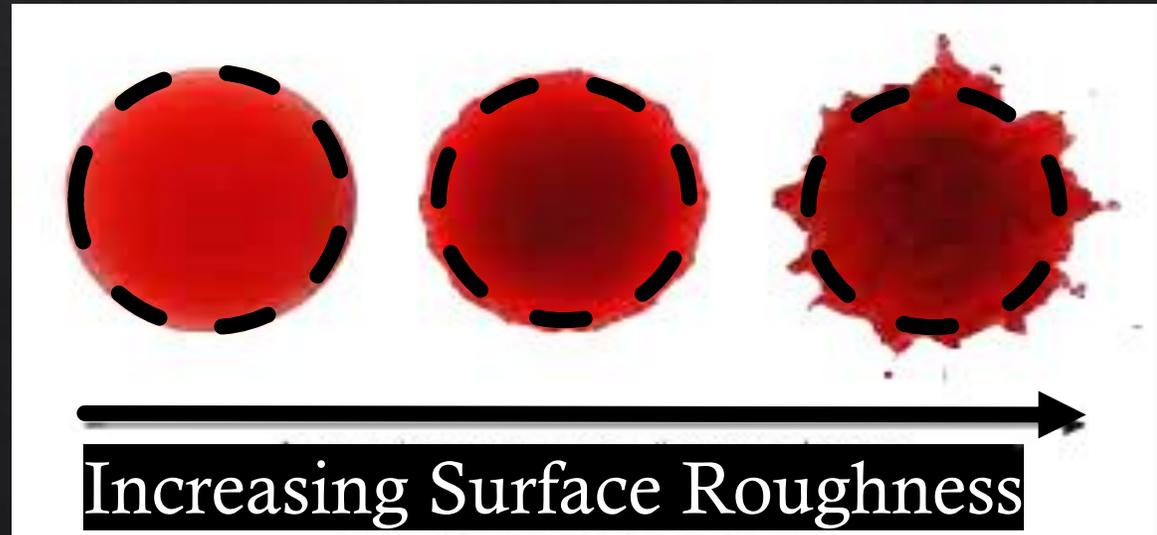
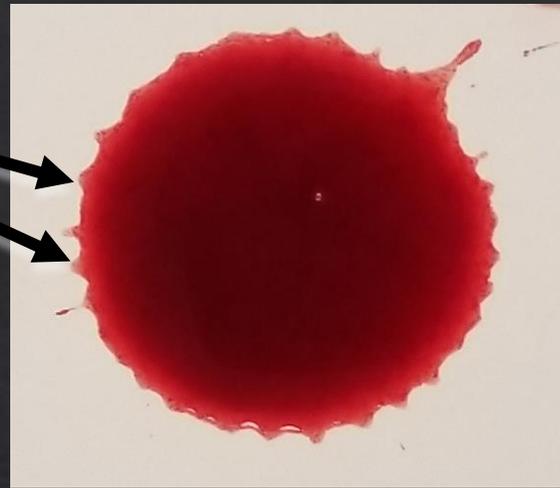
Surfaces

Deformed

Cohesion

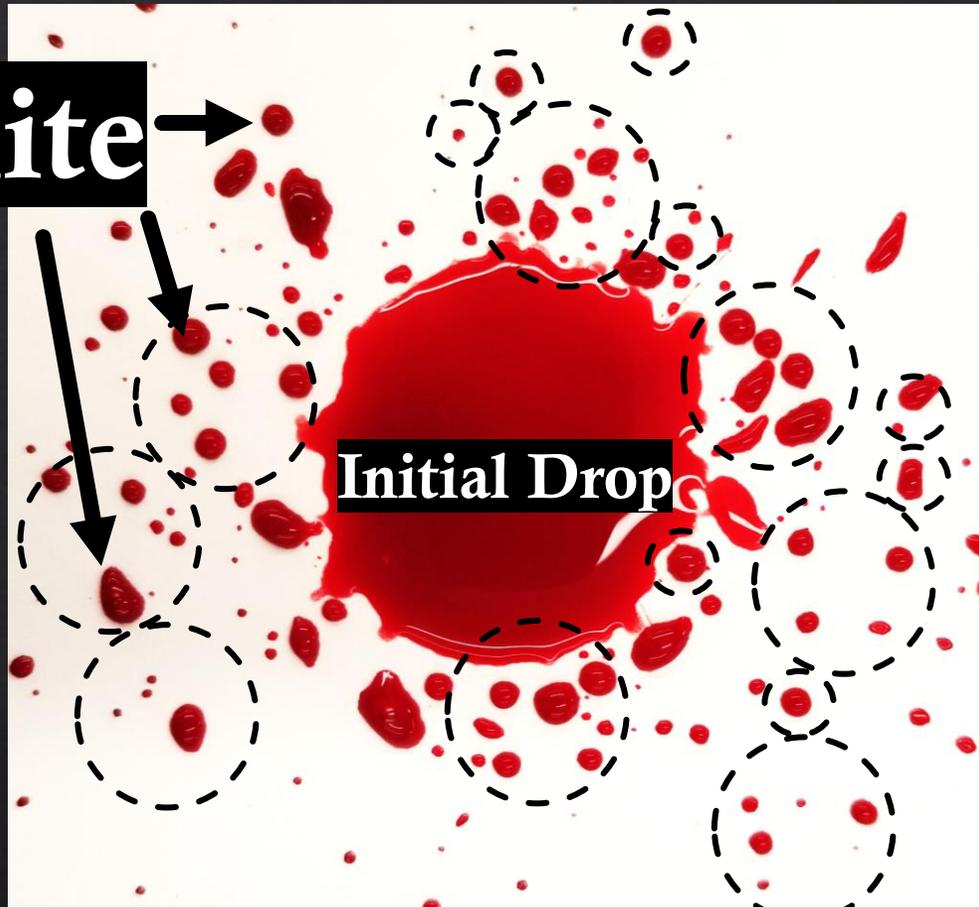
Adhesion

Spines



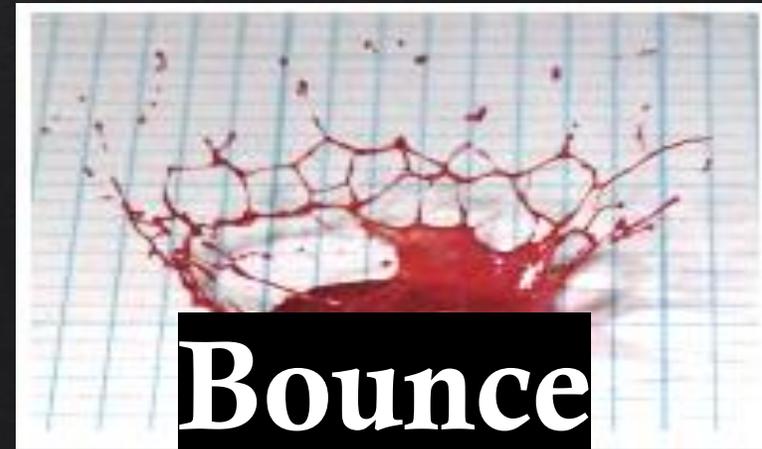
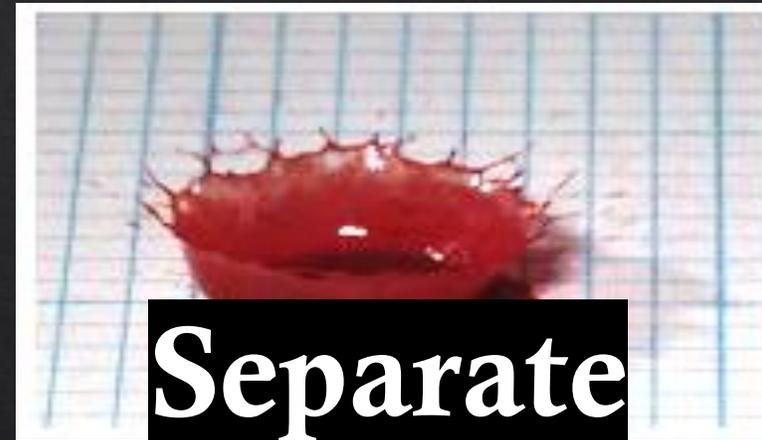
Satellites

Satellite →



Impact

Smaller Particles



Stains and Patterns

Passive

Impact

Transfer

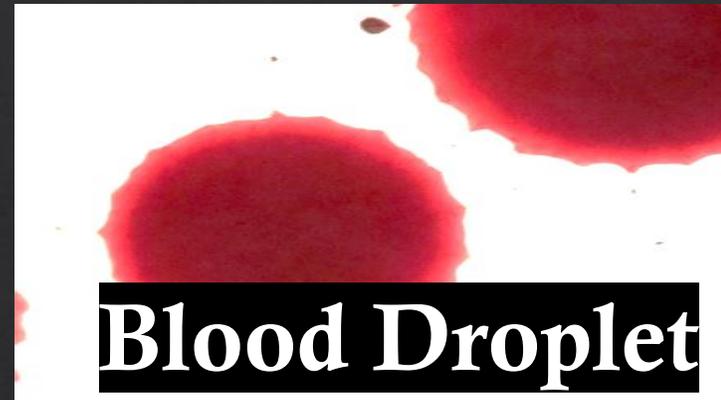
Passive

Gravity

Blood Droplet

Pool

Flow



Blood Droplet

Single Droplet

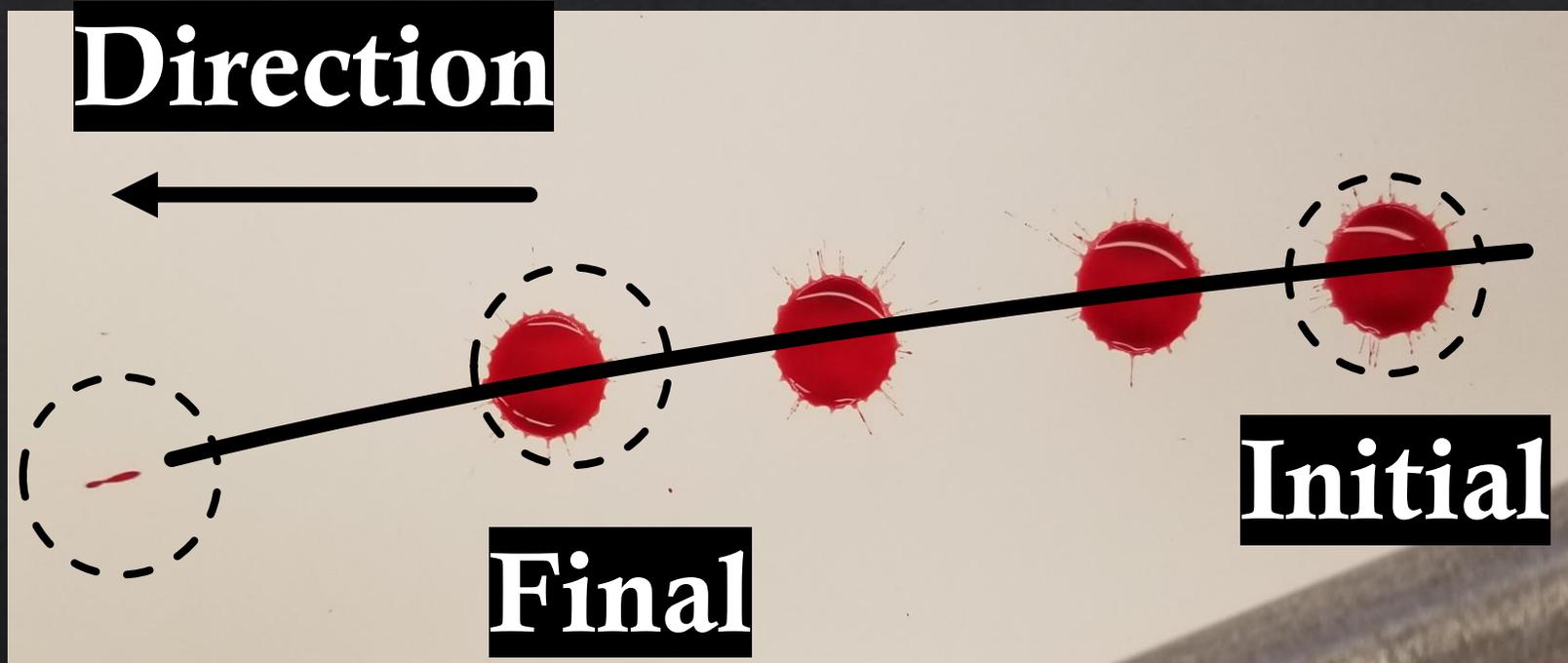
Trail

Movement

Vector

Magnitude

Direction



Pool

Multiple Droplets

Accumulation

Same location

Volume

Saturation

Another Pattern



More Saturated



Less Saturated

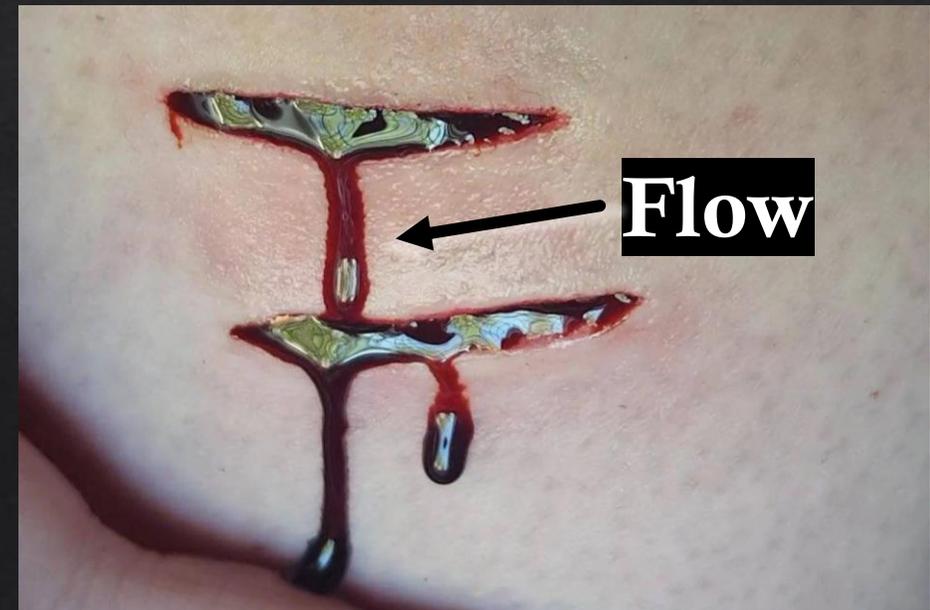
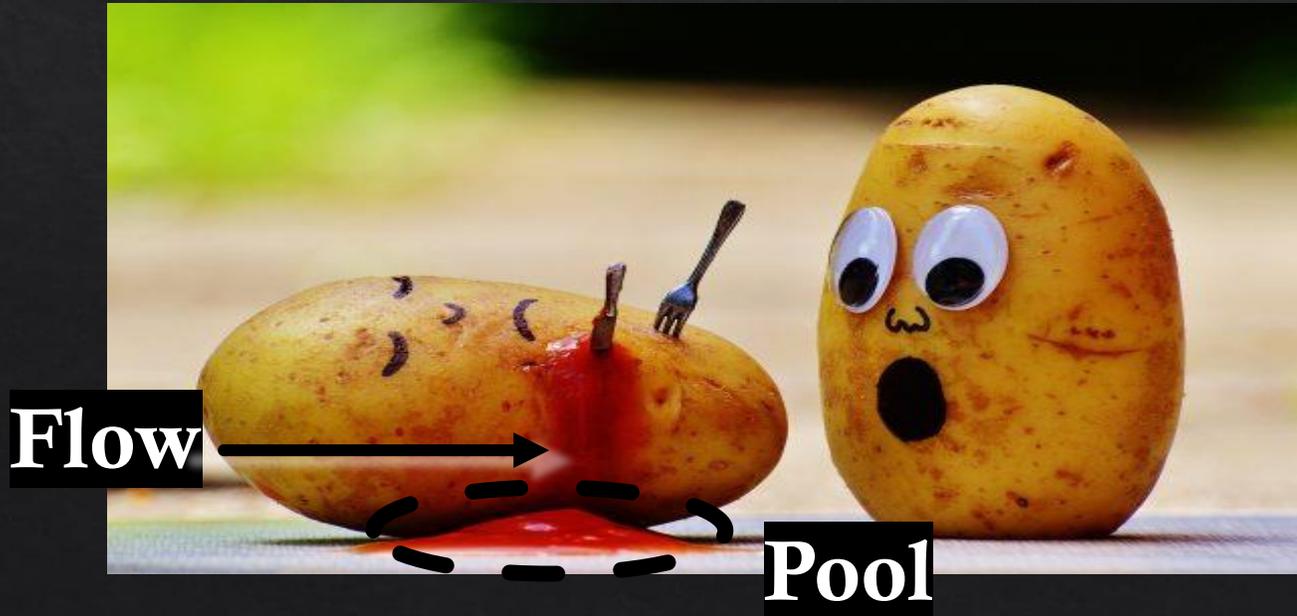
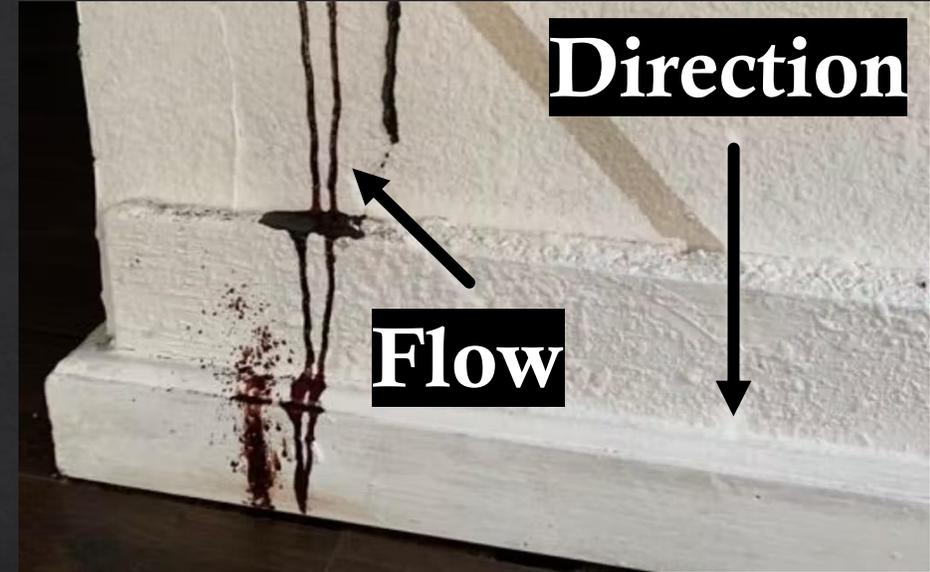


Trail

Pool

Flow

Gravitation
Migration



Impact

Flight Path

Cast-Off

Expired

Arterial

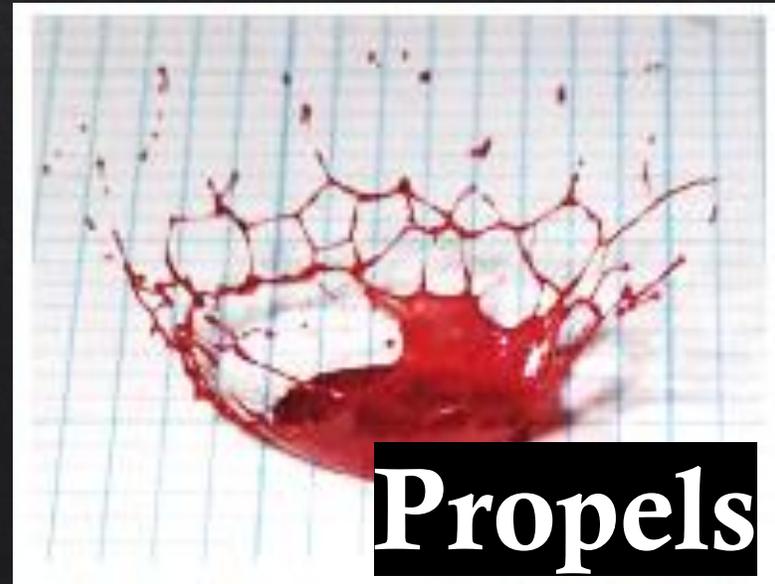
Void

Gunshot

Cast-Off Spatter

Bounces off Target Site

Propelled

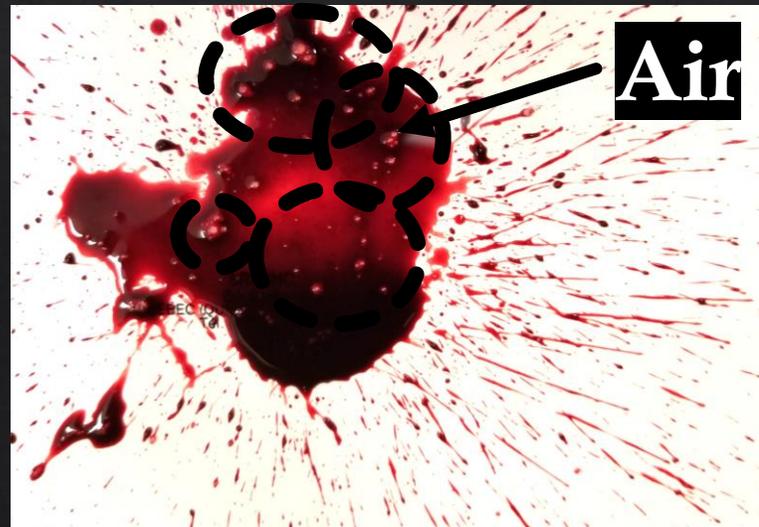
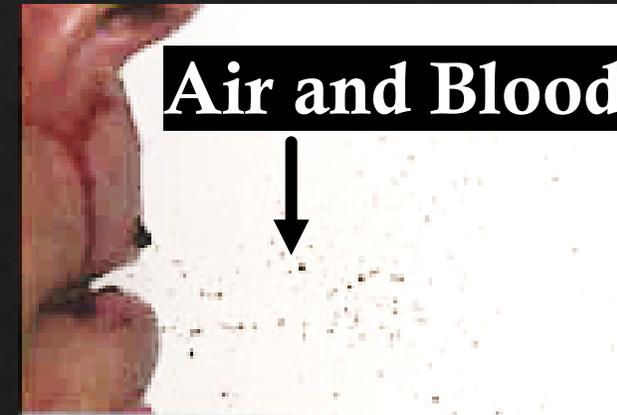
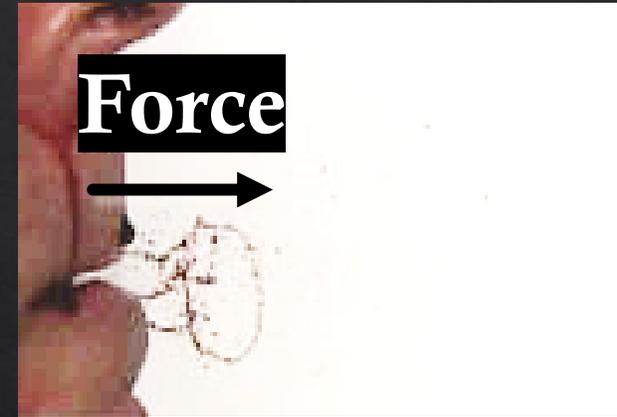


Expired Spatter

Blood mixed with air molecules

High-Pressure

Nose, Mouth, Lungs



Arterial Pattern

Spray and Flow

Large Release of Blood

Pressure

Artery

Punctured

Severed



Void Pattern

Flight Path

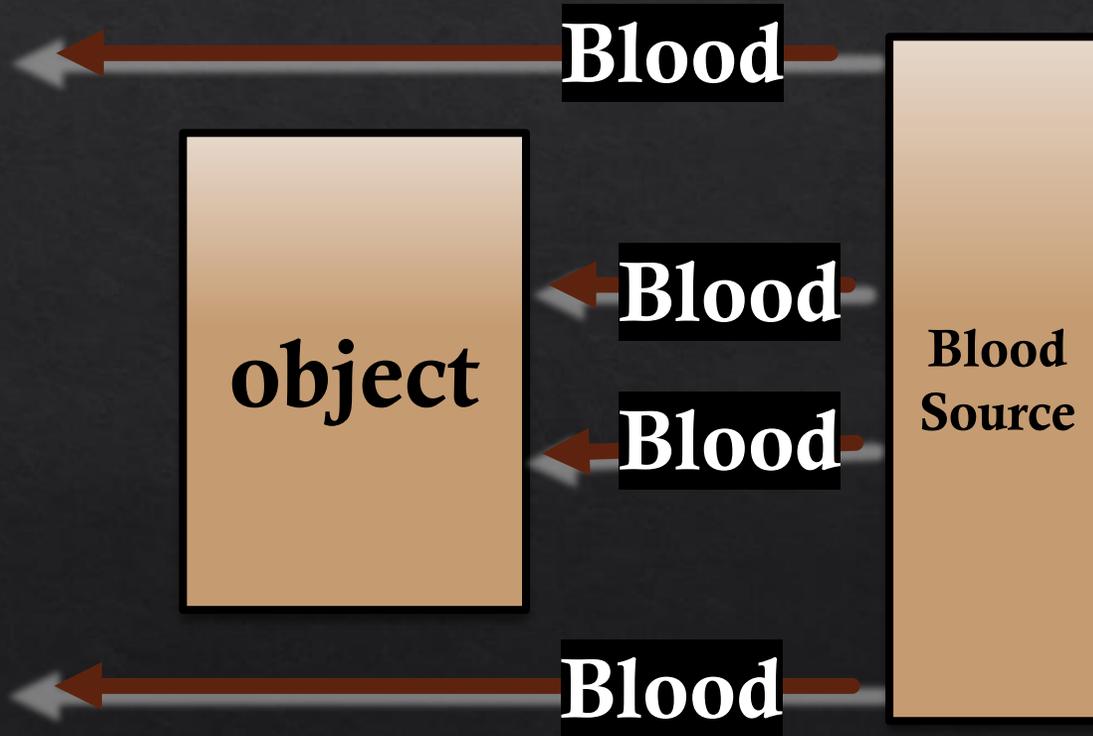
Object

Area

Outline

Empty

Shape



Before Blood



Flight Path



Shape Pattern

Gunshot Patterns

Entry and Exit Wound

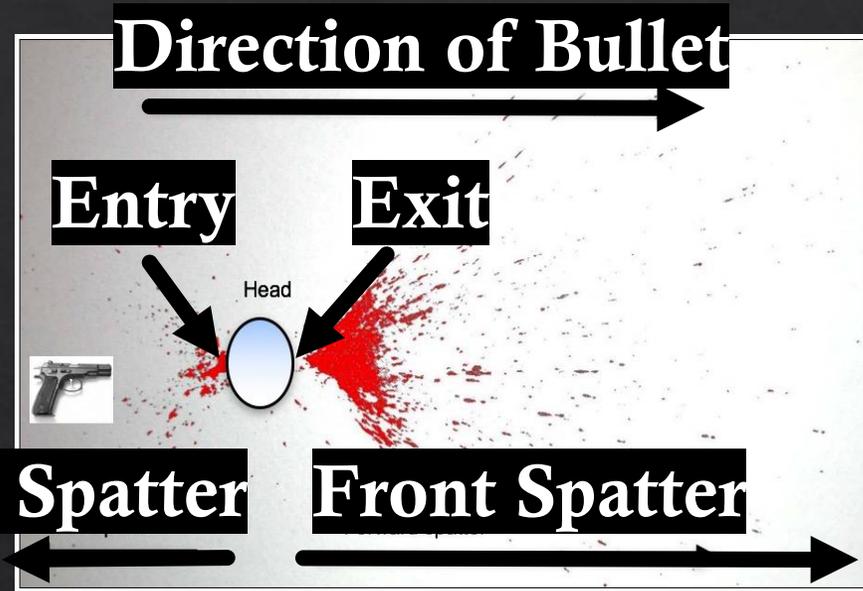
Back and Front Spatter

Velocity

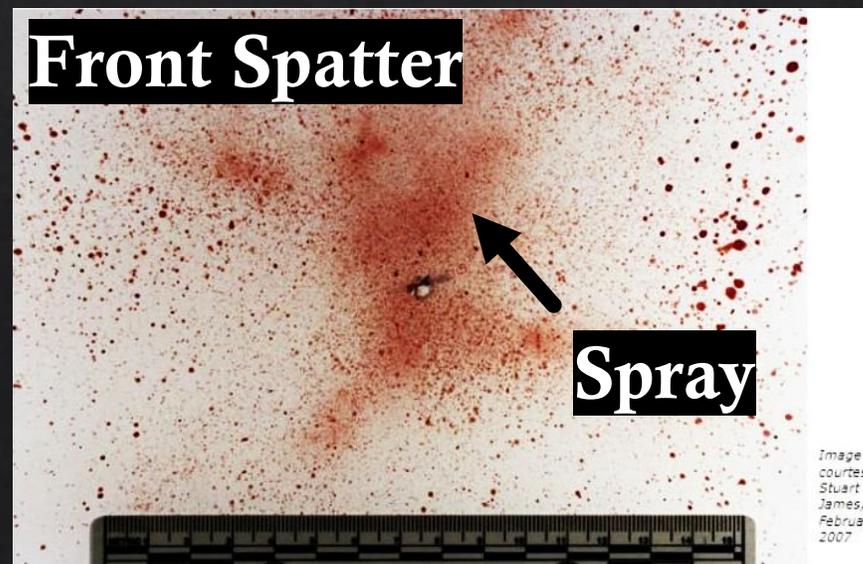
Damage

Exit Spray

Entry Drops



Enters and Exits



Blood Travels

Image courtesy Stuart James, February 2007

Transfer Stain

Contact

Smears and Smudges

Wipes

Swipes

Impressions

Physical Changes

Smears and Smudges

Distortion

Wipes

Alters or Changes

Swipes

Movement

Feathering



Smear



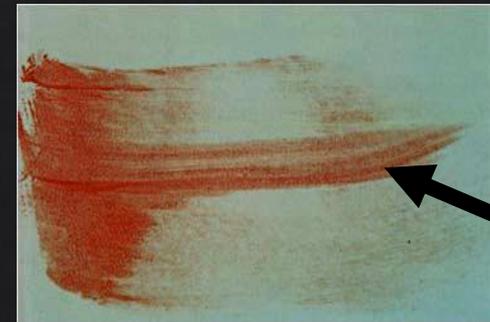
Drag



Fabric



Wipe



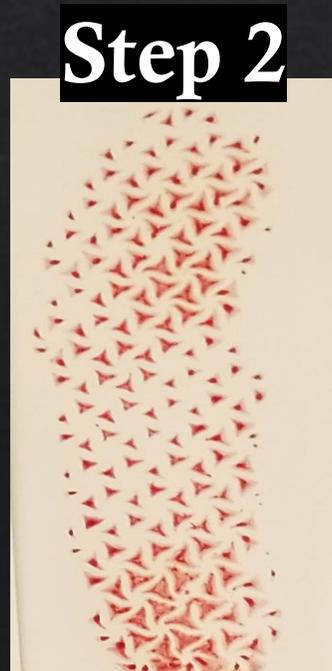
Feathering

Impressions

Shape

Handprint

Shoe Impression



Detecting Blood

Visible

Non-Visible

Visible

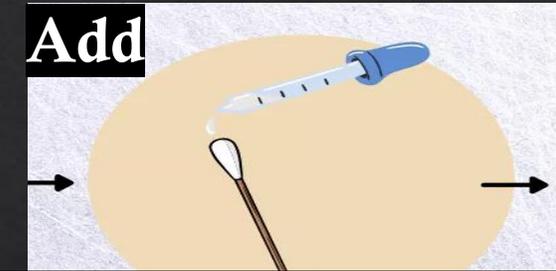
Kastle-Meyer or Phenolphthalein Test

Kastle-Meyer Reagent / Phenolphthalein

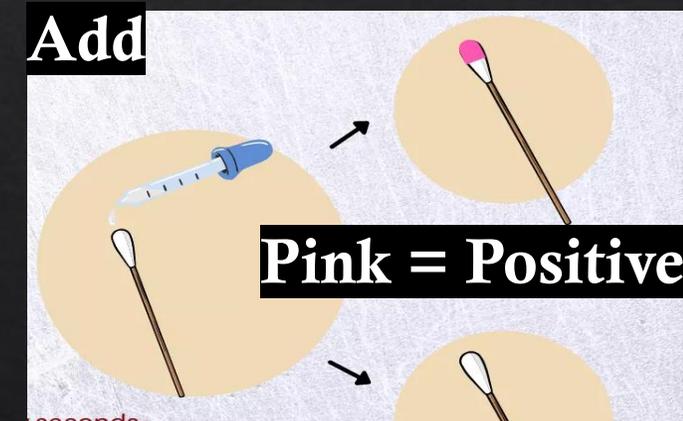
Hydrogen peroxide

Oxidation

Ethanol



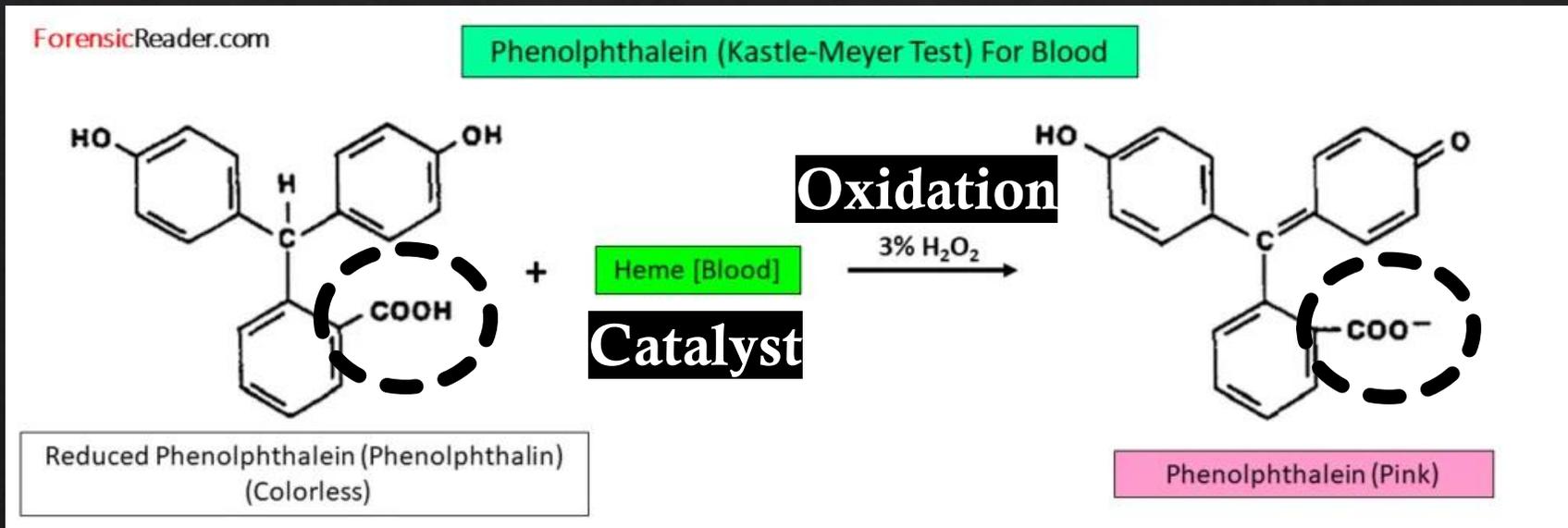
Phenolphthalein Sol.



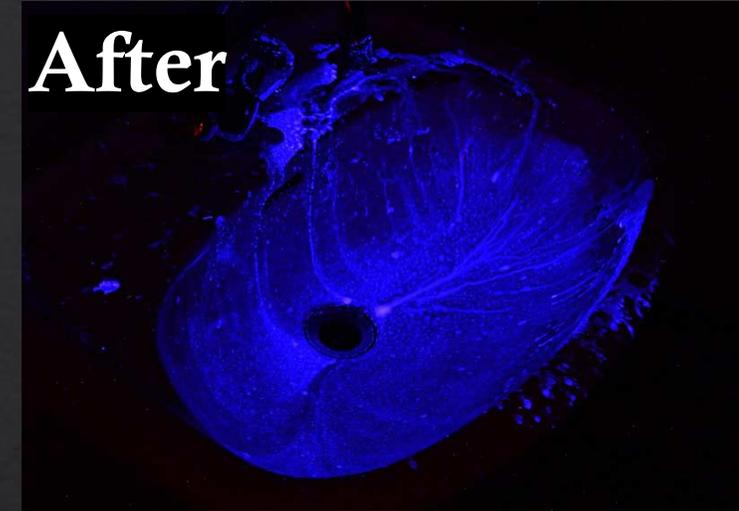
Pink = Positive

Hydrogen peroxide Sol.

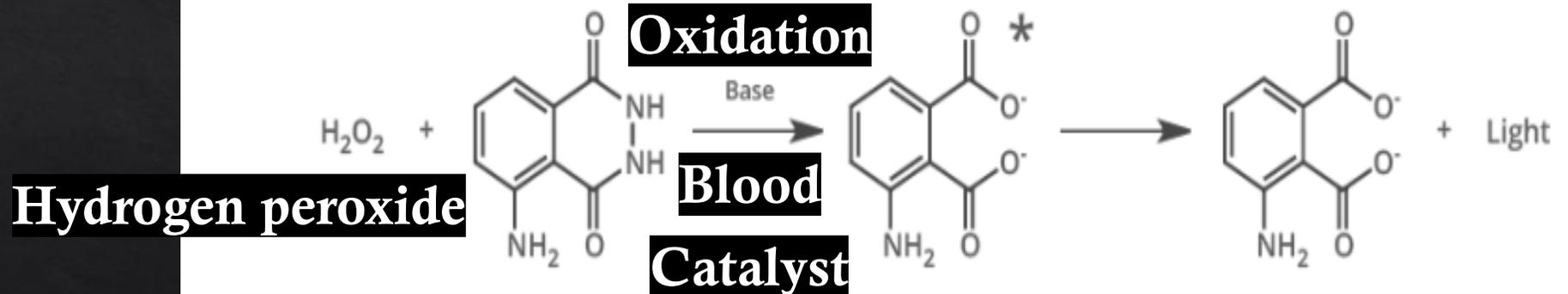
Clear = Negative



Non-Visible
Luminol
Oxidizing Agents
Alkaline Solution
High pH



Sodium hydroxide



Luminol solution also contains an oxidising agent, such as hydrogen peroxide, and a base. In the presence of a catalyst, the reaction produces energy, promoting electrons in the product to higher energy levels, before they fall back down and release their excess energy as light.

Bloodstain Pattern Analysis

Criminal Justice System

Evidence and Science

Math, Physics,

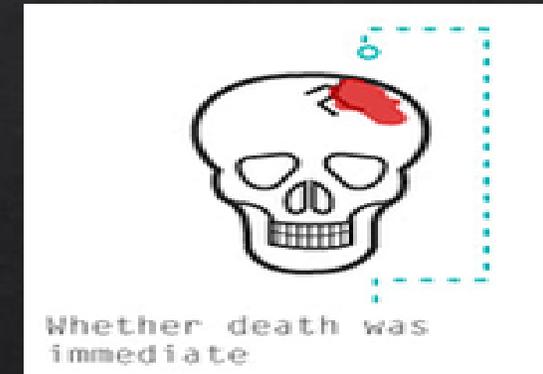
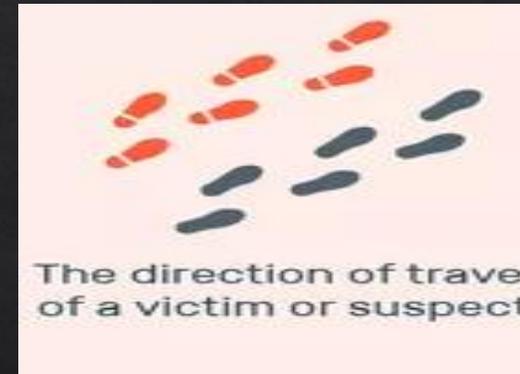
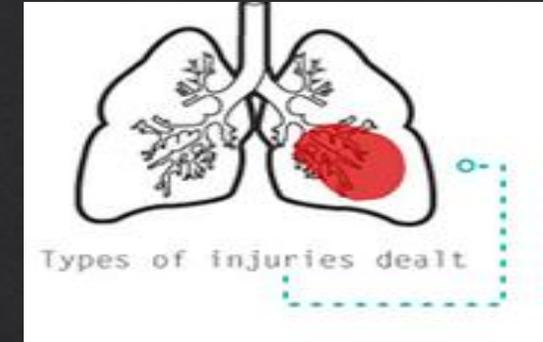
Chemistry, and Biology

Draws Conclusions

Blood is our life force

Knowledge in the form

of blood



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