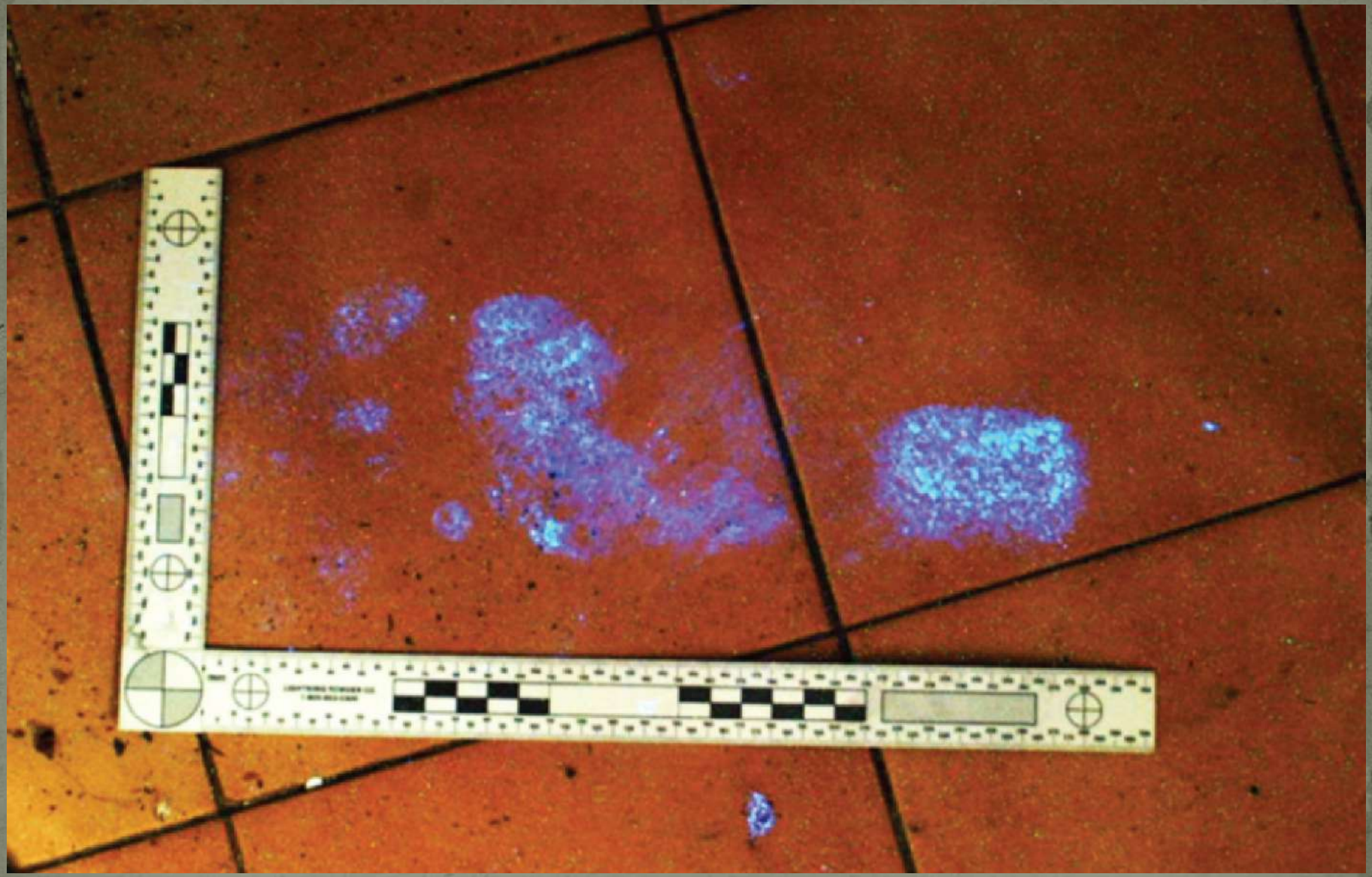
5.2: BLOOD TESTS & SPATTER ANALYSIS

Press **F5** on the keyboard to start the slideshow

The Use of Luminol Photography for Bloodstain Pattern Analysis

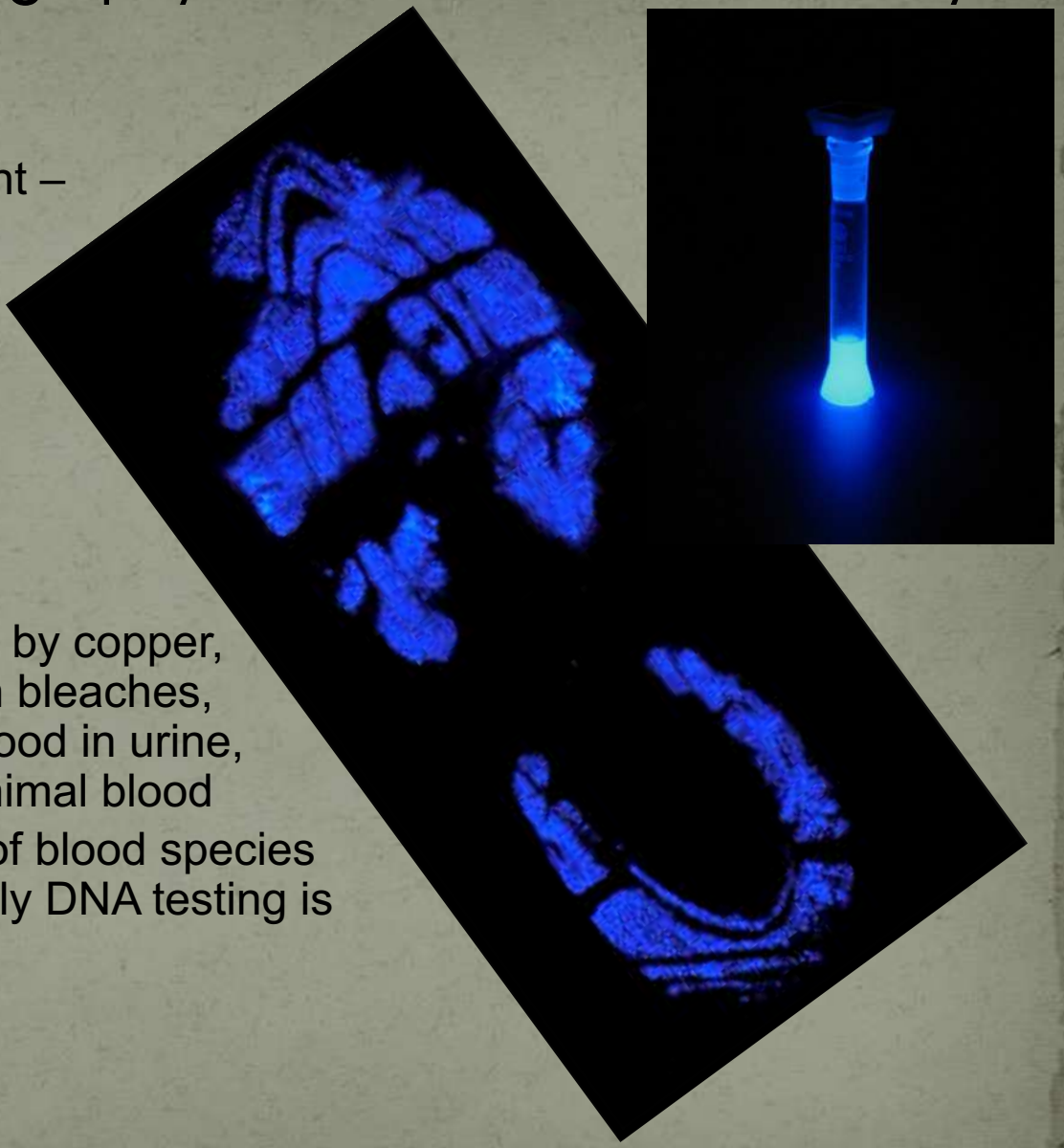
- Luminol
  - The most sensitive chemical test that is capable of presumptively detecting bloodstains diluted up to 300,000 times.
  - It's reaction with blood emits light and thus requires the result to be examined in a darkened area

- Excellent search technique for:
  1. Latent bloodstains at crime scenes
  2. Those scenes where it is suspected that attempts were made to clean bloodstains from an area
     - Applied by a spraying technique
     - Wide areas can be efficiently searched for blood



The Use of Luminol Photography for Bloodstain Pattern Analysis

- Luminol
  - Reacts with an oxidizing agent – iron in hemoglobin
  - Results in a striking blue glow
  - Lasting about 30 seconds
  - Drawbacks:
    - Not specific to blood
      - Can also be triggered by copper, horseradish, certain bleaches, trace amounts of blood in urine, fecal matter, and animal blood
      - Further confirmation of blood species testing and ultimately DNA testing is essential

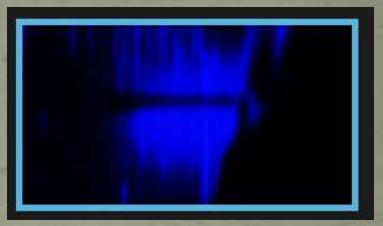



A


B

http://www.smithsonianchannel.com/videos/how-to-find-bloodstains/20589

The link above contains a short video. Click on the one that looks like this:



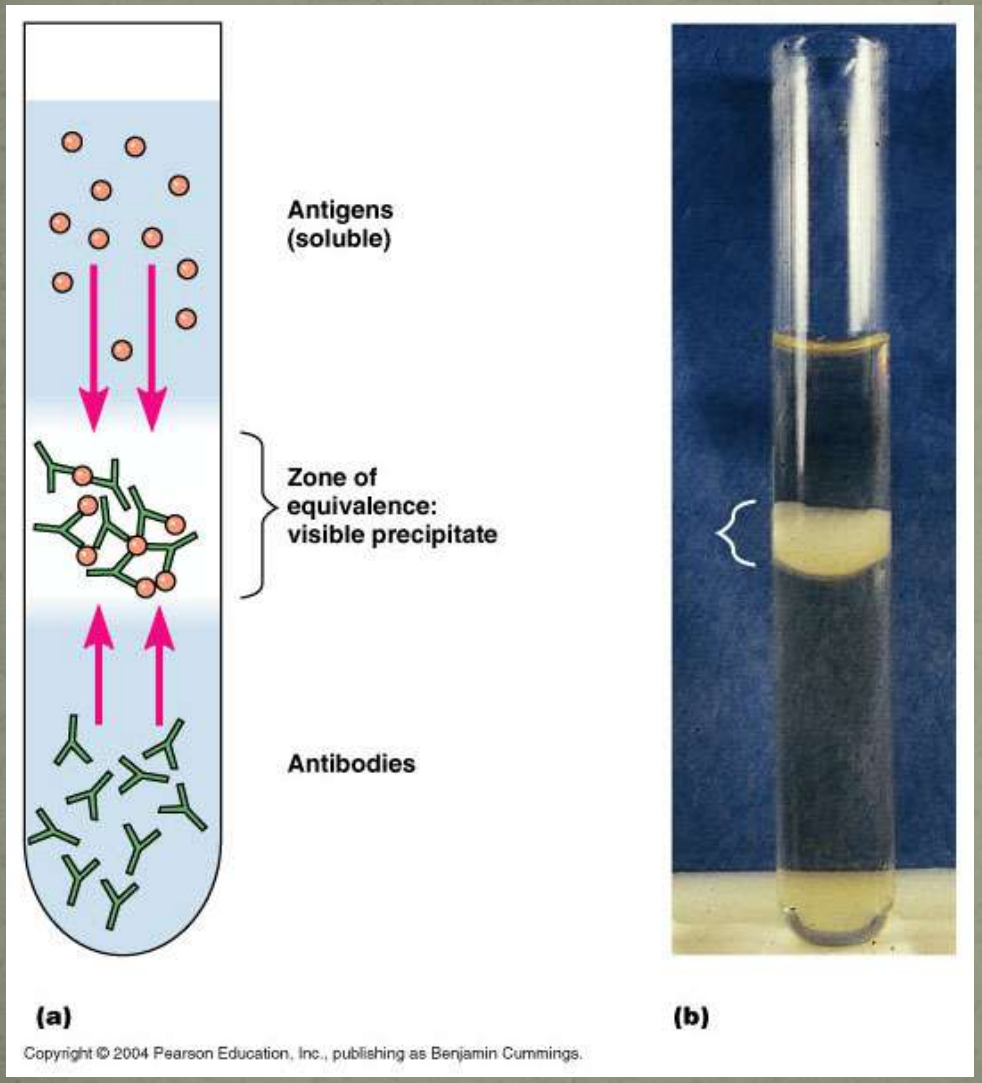
Before clicking on the link above, please insert your headphones/earbuds.

Immunoassay:

Useful to detect drugs in blood and urine.

Combine the drug with a protein and inject it into an animal (rabbit), the drug-protein complex acts as an antigen to which the animals antibodies react

Precipitin Test:



- Used to determine if blood is of human or animal origin
- Animals are injected with human blood and the animal produces antibodies and forms a precipitate

-Serology: study of antigen-antibody reactions

What questions must be asked when examining dried blood?

1. Is it blood?

2. What species did the blood originate?

3. Is it human blood?

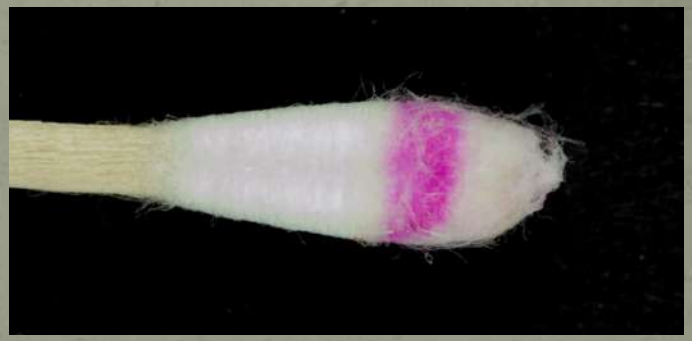
Kastle-Meyer Test:

*Color test used to detect blood

*Phenolphthalein used

*Mix=blood +phenol.+ hydrogen peroxide

*Result=blood produces a hot pink color because of oxidation of hemoglobin



How is blood a source of FORENSIC EVIDENCE?

1) Origin(s) of bloodstain
2) Distance of bloodstain from target
3) Direction from which blood impacted

4) Speed with which blood left its source
5) Position of victim & assailant
6) Movement of victim & assailant
7) Number of blows/shots

PROPERTIES OF BLOOD

BLOOD VOLUME

- On average, blood accounts for 8 % of total body weight

- 5 to 6 liters of blood for males
  4 to 5 liters of blood for females

BLOOD VOLUME (con't)

- A 40 percent blood volume loss, internally or/and externally, is required to produce irreversible shock (death).

- A blood loss of 1.5 liters, internally or externally, is required to cause incapacitation.

http://www.smithsonianchannel.com/videos/these-are-the-three-main-categories-of-bloodstain-pattern/20588

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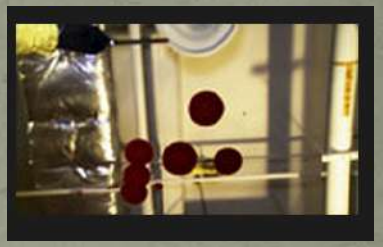

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SURFACE TENSION

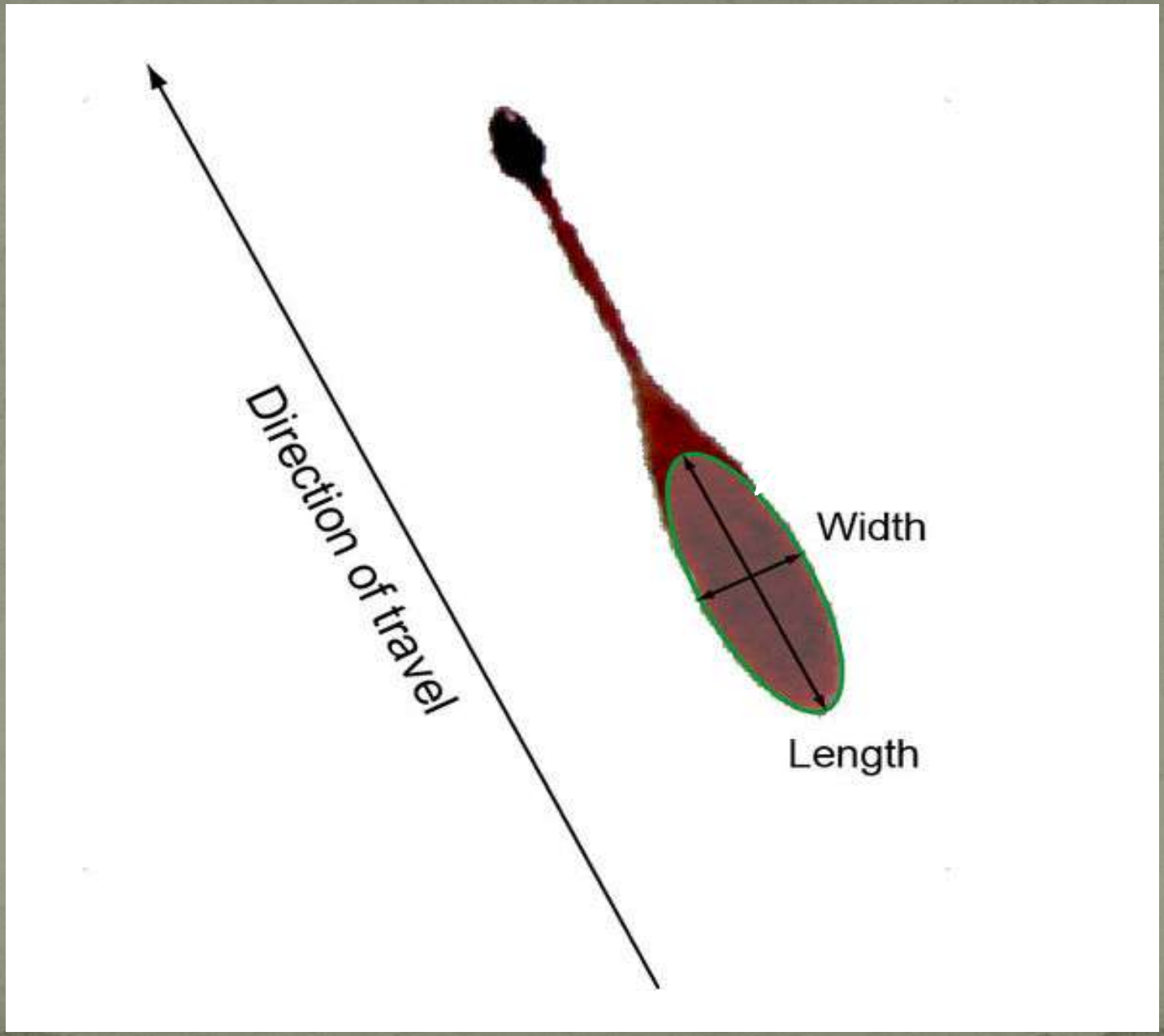
- Experiments with blood have shown that a drop of blood tends to form into a *sphere* in flight rather than the artistic teardrop shape.
- The formation of the sphere is a result of surface tension that binds the molecules together.
- This elastic like property of the surface of the liquid makes it tend to contract.

- More rapid bleeding may result in slightly larger drops.

- BUT, on the contrary, slower bleeding does not result in smaller drops.

- **Blood cast from a moving source will tend to consist of smaller droplets.**

- **Blood behaves as a *projectile in motion* and obeys the laws of physics and mathematics.**


Direction of travel
Width
Length

CATEGORIES OF BLOOD STAINS

- PASSIVE
- TRANSFER
- PROJECTED

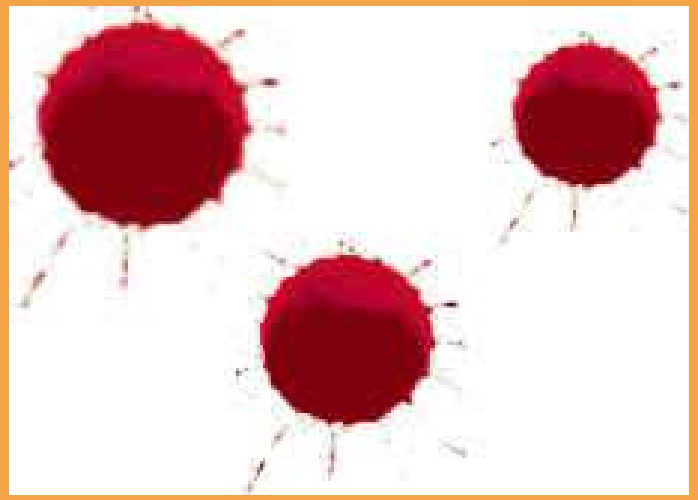
PASSIVE

DEFINITION: drops created or formed by the force of gravity acting alone.

EXAMPLES:

Drops
Drip Patterns
Pools
Clots

“Passive” PICTURES:



TRANSFER

DEFINITION: created when a wet, bloody surface comes in contact with a secondary surface.

EXAMPLES:

Contact bleeding
Swipe or Smear
Wipe
Smudge

“Transfer” PICTURES:

A recognizable image of all or a portion of the original surface may be observed in the pattern.

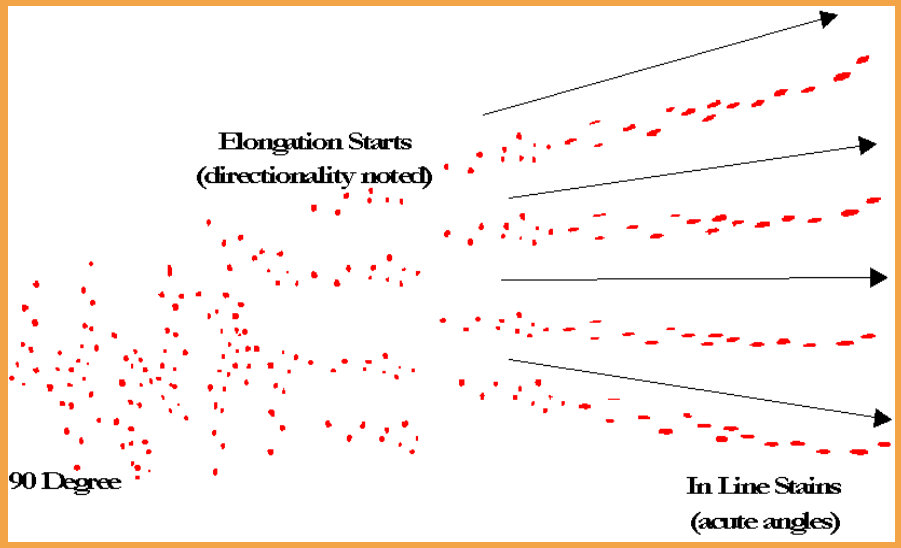
PROJECTED

DEFINITION: created when an exposed blood source is subjected to an action or force, greater than the force of gravity.

EXAMPLES:

Arterial Spurt / Gush
Cast-Off
Impact Spatter

“Projected” PICTURES:



CATEGORIES OF IMPACT SPATTER

Low Velocity

Medium Velocity

High Velocity

LOW VELOCITY

Relatively large stains 4mm in size and greater.

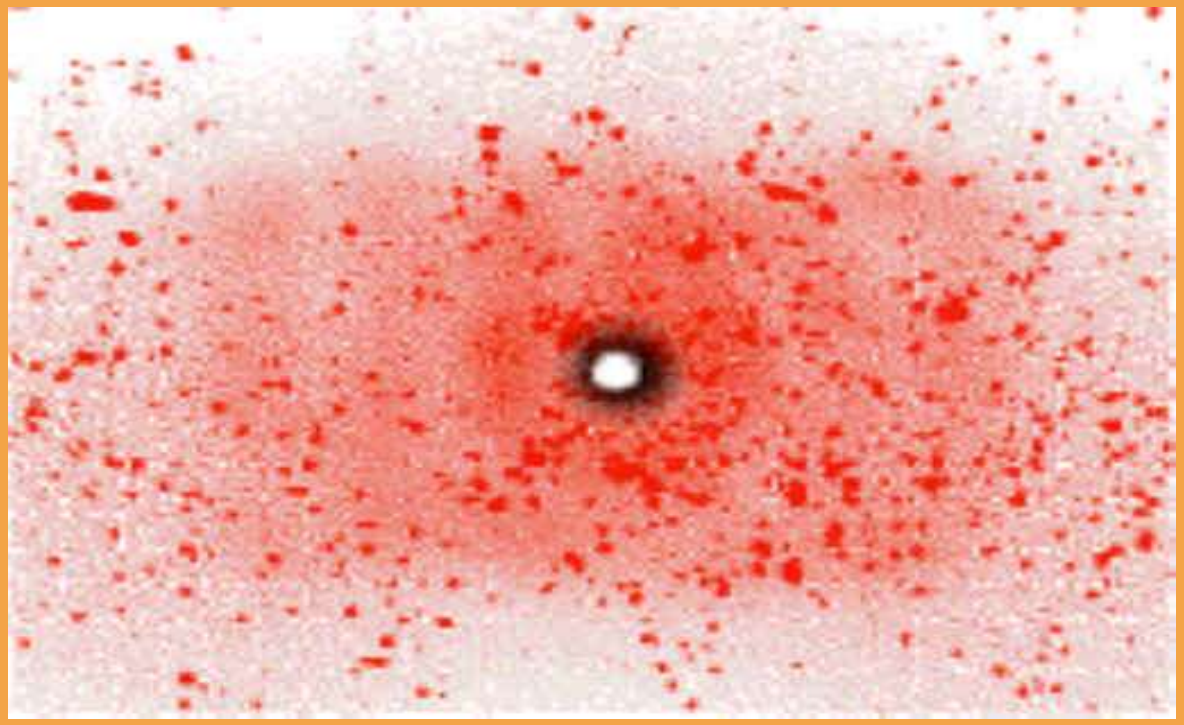
Gravitational pull up to 5 feet/sec.

MEDIUM VELOCITY

Preponderant stain size 1 to 4mm in size.

Force of 5 to 25 feet/sec.

HIGH VELOCITY



Preponderant stain size 1mm or greater.

Force of 100 feet/sec. or greater.

DIRECTIONALITY OF BLOOD

The spherical shape of blood in flight is important for the calculation of the angle of impact (AOI) of blood spatter when it hits a surface.

When a droplet of blood strikes a surface perpendicular (90 degrees) the resulting bloodstain will be circular. That being the length and width of the stain will be equal.

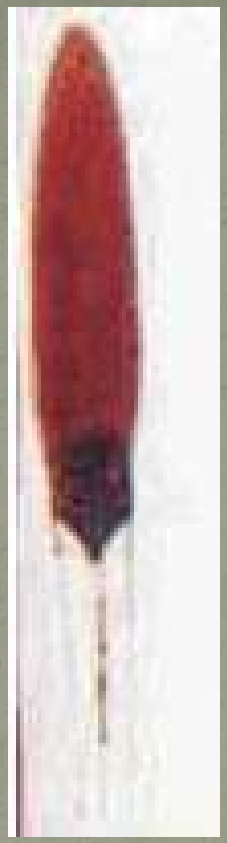
90° ANGLE

Blood that strikes a surface at an angle less than 90 degrees will be elongated or have a tear drop shape.

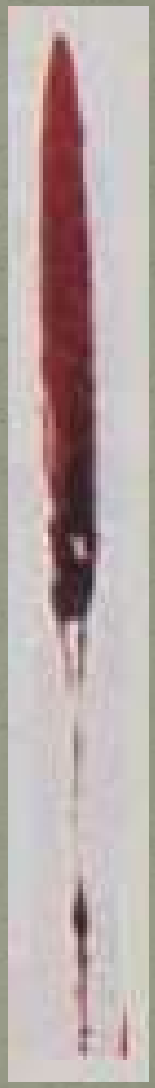
70° ANGLE

45° ANGLE

30° ANGLE



10° ANGLE



5° ANGLE